LECTURE NOTES

EPA AND THE ENVIRONMENTAL ASPECTS OF DREDGED-MATERIAL DISPOSAL

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EPA AND THE ENVIRONMENTAL ASPECTS OF DREDGED-MATERIAL DISPOSAL

for

1991 Dredging Short Course
Texas Engineering Experiment Station
Texas A&M University
College Station, Texas

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Marine and Estuarine Protection

This document is provided for use and discussion in conjunction with the *1991 Dredging Engineering Short Course,* sponsored by Texas Engineering Experiment Station, Texas A&M University. The information provided in the document should not be construed either as official guidance or policy. Much of the text is extracted from draft documents. As such, the full technical accuracy of the material is not yet confirmed.

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INTRODUCTION

The document presents the Environmental Protection Agency's (EPA) regulatory responsibilities and activities concerning environmental aspects of dredged-material disposal in United States waters.

The goal of the EPA is to ensure that dredged-material disposal in the United States is accomplished in a manner that will not endanger either human health or the marine environment. Operating under the authority of the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA) and the Clean Water Act (CWA, Section 404), EPA promulgates and participates in the implementation of regulations relative to dredged-material disposal in the waters of the United States.

To accomplish the above goal, EPA Headquarters has the general responsibility for promulgating ocean-dumping regulations and developing EPA National ocean-dumping policy and technical guidance. Specific EPA activities include

1. Developing regulations and guidance
   - EPA is currently revising the Ocean Dumping Regulations.
   - EPA is developing several technical guidance documents to aid in the coordination and consistent management of dredged-material disposal activities. These documents are
     - *Draft Ecological Evaluation of Proposed Discharge of Dredged Material into Ocean Waters* – EPA/United States Army Corps of Engineers (USACE) 1990 (in preparation by Battelle Ocean Sciences and EA Engineering, Science and Technology, Inc.; final document available in early 1991).

       This document is an update of the July 1977 "Green Book" and contains procedures for evaluating the potential environmental impact of dredged-material disposal as mandated by the United States ocean-dumping regulations.
     - Draft *Dredged Material Disposal Strategy Document* – EPA/USACE 1990 (in preparation by Battelle Ocean Sciences and EA Engineering, Science, and Technology, Inc.; final document available in early 1991).

This document presents a National dredged-material management strategy in a generic decision-making framework, including all of the alternatives for dredged-material disposal under the jurisdictions of the MPRSA and the CWA.

- Draft *EPA Guidance Manual for the Review of COE Permits and Federal Projects for the Ocean Disposal of Dredged Material* – EPA 1990 (in preparation by Battelle Ocean Sciences and Science Applications International Corporation; final document available in mid-1991).

  This document provides procedural and technical guidance to EPA Regional staff in reviewing ocean-disposal proposals involving dredged material under the jurisdiction of the MPRSA.

- Working Draft *Site Designation, Monitoring, and Management Guidance Document for Ocean Disposal of Dredged Material* – EPA 1990 (in preparation by Battelle Ocean Sciences and Tetra Tech, Inc.; final document available in mid-1991).

  This technical-guidance document describes the requirements and technical rationale for dredged-material ocean-disposal site designation, monitoring, and management.

Note: Each of the above documents is either a draft or a working draft and is subject to revision prior to publication as a Final Report.

2. Designating disposal sites

EPA designates ocean dredged-material disposal sites (ODMDS) where dumping is permitted under USACE-issued permits. 65 million cubic yards of dredged material are dumped annually at the 45 interim- and 59 final-designated ODMDSs in U.S. waters.

ODMDS designation is based on the following five general and 11 specific criteria from the ocean dumping regulations.

General Disposal-Site Criteria [40 CFR 228.5 (a-e)]

(a) The dumping of materials into the ocean will be permitted only at sites or in areas selected to minimize the interference of disposal activities with other activities in the marine environment, particularly avoiding areas of existing fisheries or shellfisheries, and regions of heavy commercial or recreational navigation.

(b) Locations and boundaries of disposal sites will be so chosen that temporary perturbations in water quality or other environmental conditions during initial mixing caused by disposal operations anywhere within the site can be expected to be reduced to normal ambient seawater levels or to undetectable contaminant concentrations or effects before reaching any beach, shoreline, marine sanctuary, or known geographically limited fishery or shellfishery.

(c) If at any time during or after disposal site evaluation studies, it is determined that existing disposal sites presently approved on an interim basis for ocean dumping do not meet the criteria for site selection set forth in § 228.5 through § 228.6, the

use of such sites will be terminated as soon as suitable alternate disposal sites can be designated.

(d) The sizes of ocean disposal sites will be limited in order to localize for identification and control any immediate adverse impacts and to permit the implementation of effective monitoring and surveillance programs to prevent adverse long-range impacts. The size, configuration, and location of any disposal site will be determined as a part of the disposal site evaluation or designation study.

(e) EPA will, wherever feasible, designate ocean dumping sites beyond the edge of the continental shelf and other such sites that have been historically used.

Specific Disposal-Site Criteria [40 CFR 228.6(a)(1-11)]

(1) Geographical position, depth of water, bottom topography, and distance from coast

(2) Location in relation to breeding, spawning, nursery, feeding, or passage areas of living resources in adult or juvenile phases

(3) Location in relation to beaches and other amenity areas

(4) Types and quantities of wastes proposed to be disposed of, and proposed methods of release, including methods of packing the waste, if any

(5) Feasibility of surveillance and monitoring

(6) Dispersal, horizontal transport, and vertical mixing characteristics of the area, including prevailing current direction and velocity, if any

(7) Existence and effects of current and previous discharges and dumping in the area including cumulative effects

(8) Interference with shipping, fishing, recreation, mineral extraction, desalination, fish and shellfish culture, areas of special scientific importance and other legitimate uses of the ocean

(9) The existing water quality and ecology of the site as determined by available data or by trend assessment or baseline surveys

(10) Potentiality for the development or recruitment of nuisance species in the disposal site

(11) Existence at or in close proximity to the site of any significant natural or cultural features of historical importance.

Since 1986, EPA has conducted surveys of proposed, candidate, and interim ODMDSs by using the EPA Ocean Survey Vessel *Peter W. Anderson* (OSV *Anderson*).

3. Evaluating permits

Under the MPRSA, EPA is charged with developing the permit-application review criteria. Section 102(a) of the MPRSA provides that, in developing these criteria, EPA is to take into consideration the following statutory factors:

- Need for the proposed dumping
- Effects of such dumping on human health and welfare, including economic, esthetic, and recreational values
- Effects of such dumping on fisheries resources, plankton, fish, shellfish, wildlife, shorelines, and beaches
- Effects of such dumping on marine ecosystems, particularly with respect to
  - The transfer, concentration, and dispersion of such material and its byproducts through biological, physical, and chemical processes
  - Potential changes in marine-ecosystem diversity, productivity, and stability
  - Species and community population dynamics
- Persistence and permanence of the effects of the dumping
- Effects of dumping particular volumes and concentrations of such materials
- Appropriate locations and methods of disposal or recycling, including land-based alternatives and how requiring the use of such alternative locations or methods could impact the public interest
- Effects on alternative uses of oceans, such as scientific study, fishing, and other living-resource exploitation, and nonliving-resource exploitation
- In designating recommended dumping sites, utilization of locations beyond the edge of the continental shelf, wherever possible, by the EPA Administrator.

With respect to such criteria as may affect the Department of the Army's Civil Works Program, MPRSA Section 102(a) directs EPA to consult with the Secretary of the Army. Under Section 103 of the MPRSA, the authority to issue dredged-material permits is vested in the Secretary of the Army, who implements this authority through the USACE. The statute provides that the Secretary may issue such permits upon a determination that the disposal will not "unreasonably degrade or endanger human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities" [MPRSA §§ 102 (a) and 103(a)]. Section 103 further provides that, in making this determination, the Secretary is to apply the EPA criteria relating to the effects of the dumping, together with certain other factors set out in Section 103(b) relating to the need for the dumping and alternative disposal methods. In addition, the statute directs the Secretary to utilize to the extent feasible ocean-dumping sites that have been designated by EPA. Prior to issuing permits, the statute affords EPA an opportunity to review the decision, and if EPA finds that the proposed disposal will not comply with the EPA criteria relating to the effects of the dumping, the permit may not be issued unless the Secretary applies for and obtains from EPA a waiver of the criteria. Under the statute, EPA is to grant the waiver of the criteria unless it determines that the dumping will result in "unacceptably adverse impact" on

- Municipal water supplies
- Shellfish beds
- Wildlife

- Fisheries
- Recreational areas

[MPRSA §§ 103(c) and (d)]

4. Conducting research and testing to evaluate dredged material for ocean disposal

   EPA Environmental Research Laboratories in Narragansett, Rhode Island, and Newport, Oregon, are presently conducting research on sediment-quality criteria, amphipod bioassays, and the transport and fate of dredged material at disposal sites.

5. Conducting monitoring studies at dredged-material disposal sites

   EPA and the USACE coordinate monitoring activities at ODMDSs according to site-designation monitoring plans. Frequency and intensity of site monitoring varies among disposal sites due to site use and relative impact of the disposal materials.

   Since 1986, EPA has conducted detailed surveys of dredged-material disposal sites in Florida, Mississippi, New York, Rhode Island, and Massachusetts, using the capabilities of the OSV *Anderson*.

6. Management of dredged-material disposal sites

   EPA uses data collected during monitoring studies onboard the OSV *Anderson* to evaluate

   - If dredged material is contained within the disposal sites
   - The need and location for additional disposal sites

   and make appropriate management decisions to protect the marine environment.

The EPA Regions are members of the Ocean Dumping Coordination Committee and assist Headquarters in developing policy recommendations and technical guidelines. EPA Headquarters also solicits public and other Federal (e.g., National Oceanic and Atmospheric Administration) and State agencies for advice and expertise. EPA's goal is accomplished through the cooperation of these agencies in the dredging program.

Although EPA is presently involved in both dredged-material and nondredged-material disposal projects, the passage of the Ocean Dumping Ban Act (ODBA) in November 1988 makes the ocean disposal of industrial and sewage sludge unlawful after December 1991. Therefore, this document addresses only ocean disposal of dredged material.

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official guidance or policy. Much of the text is extracted from draft documents. As such, the full technical accuracy of the material is not yet confirmed. Comments on and adaptations to the excerpted text made by the authors of this document are indicated by bracketed italic type.

Organization of this document is as follows:

1. Description of the relevant legislation and regulations pertinent to dredged material in the United States
2. Technical aspects of dredged-material evaluation, permitting, and disposal
3. Description of how technical issues may be the basis for revising regulations.

REGULATORY BASIS FOR EPA ROLE

1.0 REGULATORY BASIS FOR EPA ROLE

EPA and the United States Army Corps of Engineers (USACE) share responsibilities for the ocean-disposal program for dredged material. A number of statutes, treaties, and regulations affect the disposal of dredged material into the territorial waters of the United States. EPA's goal in administering these requirements is to ensure that management decisions regarding dredged-material disposal protect human health and the environment. The following are discussed in this Section as they relate to dredged-material disposal.

- Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, known as the London Dumping Convention (LDC)
- Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA), particularly Section 103
- Clean Water Act (CWA), particularly Section 404
- National Environmental Policy Act (NEPA)
- Ocean Dumping Regulations and Criteria

1.1 LONDON DUMPING CONVENTION (1972)

> The London Dumping Convention (LDC) [Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, December 29, 1972 (26 UST 2403:TIAS 8165)], to which the United States is a signatory, is an international treaty that deals with marine-waste disposal. The Convention entered into force for the United States on August 30, 1975. The LDC prescribes a duty to "take all practicable steps" to prevent pollution resulting from ocean dumping. The dumping of wastes is regulated by three annexes to the LDC. Annex I (the "black list") includes [*particularly*] hazardous substances [*such as*] organohalogen compounds, mercury, cadmium, oil, plastics, and high-level radioactive wastes, the dumping of which is expressly prohibited. Annex II (the "grey list") includes substances such as arsenic, lead, copper, zinc, organosilicon compounds, cyanides, and pesticides, the dumping of which may be carried out only pursuant to a "prior special permit." Any other substances [*may*] be dumped subsequent to the issuance of a general permit by the appropriate nation after careful consideration of all the factors set forth in Annex III. LDC jurisdiction includes all waters seaward of the baseline of the territorial sea. . . .
>
> [*Section 102(a) of the MPRSA directs EPA in establishing the ocean-dumping regulations to*] "apply the standards and criteria binding upon the United States under the Convention, including its Annexes." . . . Therefore, the LDC . . . directly affects the policy, regulatory, and technical aspects of the dredged material ocean disposal program. Guidance applicable to the disposal of dredged material has been adopted by

Consultative Meetings [*of*] the LDC, based on scientific and technical recommendations by the LDC Scientific Group.

The LDC forbids the dumping of dredged material containing [*the Annex I*] prohibited materials [*unless present only*] as trace contaminants [*or when rapidly rendered harmless following disposal. In general, o*]cean disposal is not an acceptable alternative for contaminated dredged material . . . unless special controls are in effect to isolate those contaminants from the marine environment. The LDC has generally agreed that management strategies, such as covering contaminated sediments with clean dredged material (capping), may be technically and scientifically feasible in low-energy environments and should continue as field research with associated monitoring programs to determine the environmental acceptability of the controls.

The text for Section 1.1 LONDON DUMPING CONVENTION (1972) was taken from EPA/USACE. 1990. Draft *Dredged Material Disposal Strategy Document.* In preparation by Battelle Ocean Sciences and EA Engineering, Science, and Technology, Inc.

1.2 MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT OF 1972

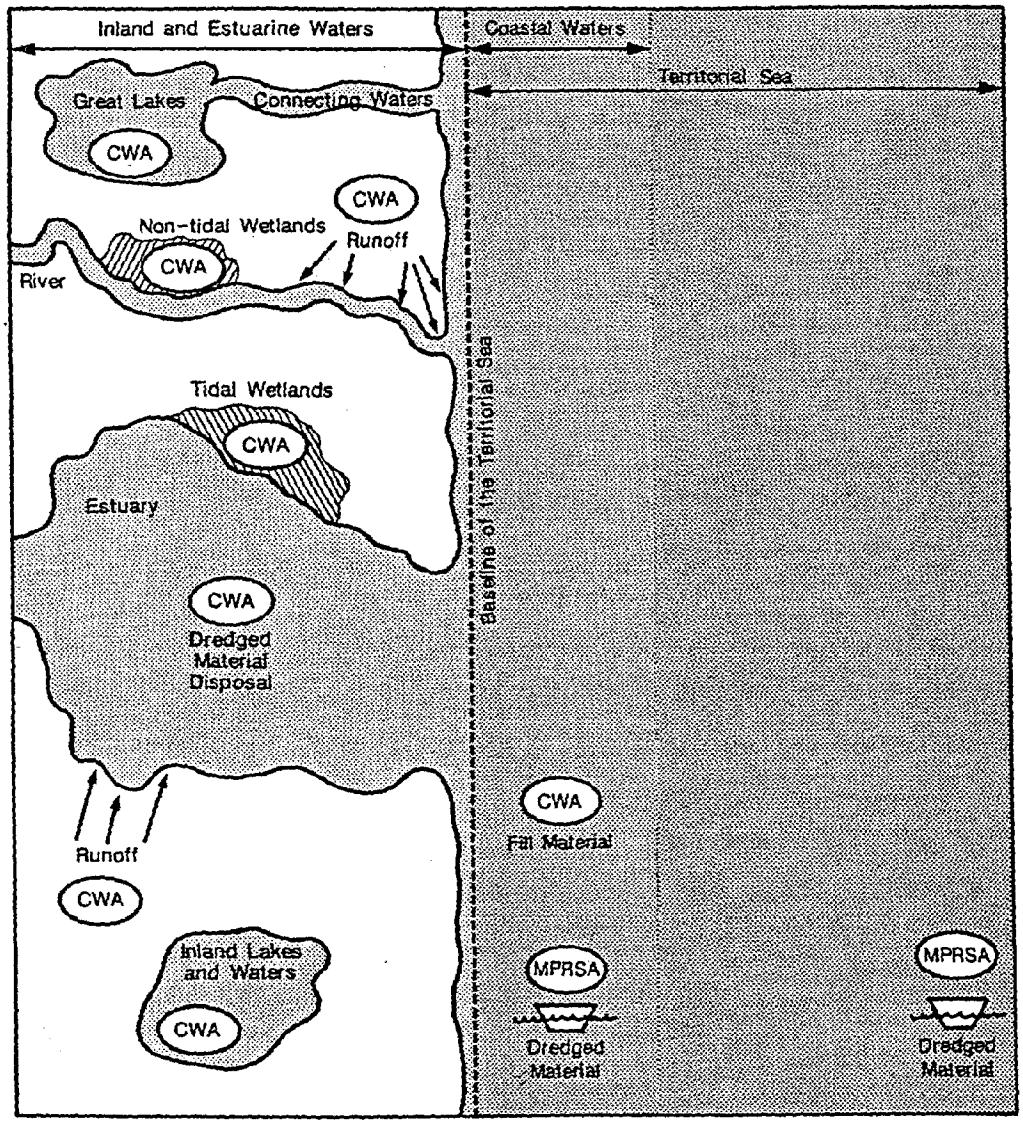
A major statute that shapes U.S. policy on marine pollution is the MPRSA (popularly called the Ocean Dumping Act), enacted in 1972 (Pub.L. No. 92-532, 86 Stat. 1052, 33 U.S.C.A. 1401 *et seq.*). [*The provisions of the LDC are implemented through the MPRSA.*] The MPRSA regulates transportation and dumping of wastes in ocean waters (Title I), establishes requirements for monitoring and research (Title II), and establishes [*the Marine Sanctuaries Program, which is implemented by NOAA*] (Title III). The intent of the MPRSA is to protect the quality of U.S. coastal and open-ocean waters by prohibiting indiscriminate disposal of materials at sea.

The MPRSA establishes the policy of the United States to "regulate the dumping of all types of materials into ocean waters and to prevent or strictly limit the dumping into ocean waters of any material which would adversely affect human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities" (MPRSA § 2, 33 USC 1401). Ocean waters are those waters of the open seas lying seaward of the baseline from which the territorial sea is measured, as provided for in the Convention on the Territorial Sea and the Contiguous Zone (15 UST 1606; TIAS 5639). The jurisdiction of the MPRSA includes coastal and open-ocean waters of the territorial seas of the United States (0-3 nmi), the contiguous zone (3-12 nmi), and beyond [*Figure 1-1*] . . . .

Under the MPRSA, the EPA and other Federal agencies are assigned responsibilities for the various statutory requirements defined by the Act [*Table 1-1*].

[• *EPA, in consultation with the USACE, promulgates criteria governing ocean disposal of dredged material.*]

- EPA and the [*USACE*] administer the permit programs under the MPRSA. [*D*]redged material [*permits*] issued by the [*USACE are subject to EPA review and concurrence*].



CWA - Clean Water Act.
MPRSA - Marine Protection, Research, and Sanctuaries Act.
Dumping beyond the boundary of the territorial sea is covered by MPRSA. CWA covers disposal of fill material within the territorial sea. Estuarine and inland aquatic discharge falls under CWA.
Adapted from: National Advisory Committee on Oceans and Atmosphere, *The Role of the Ocean in a Waste Management Strategy* (Washington, DC: U.S. Government Printing Office, 1981).

Figure 1-1. Geographical Jurisdictions of the MPRSA and CWA Regarding Dredged-Material Disposal. [From EPA/USACE. 1990. Draft *Dredged Material Disposal Strategy Document.* In preparation by Battelle Ocean Sciences and EA Engineering, Science, and Technology, Inc.]

Table 1-1. **EPA and USACE Responsibilities under the Marine Protection, Research, and Sanctuaries Act of 1972. [Provided by EPA Headquarters]**

- Under MPRSA, an ocean-dumping permit may be issued if the dumping will not "unreasonably degrade or endanger" human health, welfare, or the marine environment.
- EPA is charged with developing ocean-dumping criteria to be used in evaluating permit applications.
    - Statute lays out factors to be considered by EPA in developing the permit review criteria:
        - Need for dumping
        - Effect of dumping on human health and welfare
        - Effect of dumping on fish, wildlife, shorelines
        - Effect of dumping on marine ecosystems
        - Persistence and permanence of effects
        - Effect of dumping particular volumes and concentrations
        - Effect on alternate uses of oceans (e.g., fishing)
        - Designate sites beyond OCS wherever feasible
- Permitting authority is split between EPA and USACE:
    - EPA is the permitting authority for all materials other than dredged material.
    - USACE is the permitting authority for dredged material, subject to the EPA review/concurrence role.
- USACE is directed to use the EPA criteria relating to the effects of dumping in its permitting decisions.
    - USACE may not issue a permit if these EPA criteria are not met, unless the USACE certifies that there are no economically feasible alternatives to dumping and request a waiver of criteria from EPA.
        - EPA is to a grant waiver request within 30 days of receipt unless EPA finds that the dumping will result in "unacceptably adverse impacts" on municipal water supplies, shellfish beds, wildlife, fisheries, or recreational areas.
- EPA also is responsible for recommending sites for ocean dumping, and the USACE is directed to use EPA-designated sites to the extent feasible when selecting dumping locations.
- Dredged material constitutes the bulk of material dumped, and will be the focus of the program in the future as sewage-sludge dumping phases out.
    - Approximately 65 million cubic yards per year are ocean-dumped

[• *The U.S. Coast Guard (USCG) is*] responsible for surveillance [*activities*] and [*EPA is responsible for*] the enforcement of permit conditions.

• EPA is authorized to designate [*dredged-material*] disposal sites and [*has site-monitoring responsibilities. . . .*]

[• *EPA and the USACE cooperate in monitoring dredged-material disposal sites and the management of such sites.*]

The following Sections summarize each title of the MPRSA as it relates to dredged material disposal.

1.2.1 Title I of the MPRSA, Section 103, Regulation of Transportation and Dumping Wastes in Ocean Waters

Title I of the MPRSA regulates transportation and dumping of all materials in ocean waters [i.e., marine waters seaward of the baseline (inner boundary) of the territorial sea]. The waters subject to the MPRSA can be either open oceans or coastal waters. Specific requirements of Title I include the review of permit applications and issuing permits, [*development of regulations, and designation of ocean dumping sites.*]

1.2.2 Title II of the MPRSA, Section 201, Research within the Scope of the MPRSA

Title II, Section 201, of the MPRSA establishes a comprehensive monitoring and research program under the authority of the Secretary of Commerce. Studies of long-term effects of ocean dumping are carried out by the NOAA, the USCG, EPA, and other agencies associated with the regulation, management, and monitoring of ocean ecosystems. These studies assess the impacts of disposal of dredged material and other wastes into ocean and coastal waters, or into the Great Lakes and their connecting waters. In effect, these studies of the ocean disposal of dredged material are not limited solely to dumping from vessels. This research may also identify impacts from other dredged-material disposal options, such as dredged-material containment areas or islands, that may impact ocean or coastal ecosystems. . . .

1.2.3 Title III of the MPRSA

Title III of the MPRSA establishes the National Marine Sanctuaries Program (NMSP). Section 303(a) authorizes the Secretary of Commerce, after consultation, to designate any discrete area of the marine environment as a national marine sanctuary and promulgate regulations implementing the designation, if the Secretary determines that, among other things, "the area is of special national significance due to its resource or human-use values" and that the designation of the area as a national marine sanctuary will facilitate the objectives of "coordinated and comprehensive conservation and management of the area, including resource protection, scientific research, and public education." Federal activities, including dredged material disposal, can be performed only in these sanctuaries if the Secretary of Commerce certifies that they are consistent with the purposes of Title III of the MPRSA and can be carried out within the regulations for the sanctuary (33 CFR 209.145).

Under Section 304(a)(1)(C)(viii) of the MPRSA, the Secretary of Commerce must evaluate the advantages of cooperative Federal and State management "if all or part of a proposed marine sanctuary is within the territorial limits of any State or is superjacent to the subsoil and seabed within the seaward boundary of a State, as that boundary is established under the Submerged Lands Act." . . . The States have an acknowledged interest—environmental, economic, and otherwise—in uses made of offshore coastal and ocean environments. Section 304 of the MPRSA indicates that the Congress supports Federal/State cooperation in the increasingly complex area of ocean management, and applies at least to the geographical jurisdiction that the States have been given in the coastal zone.

1.2.4 Section 102

Section 102 of the MPRSA authorizes the EPA Administrator to designate ocean disposal sites and issue permits for the dumping of all material, except dredged materials, into the ocean waters. . . . [*Section 102 also*] directs the EPA Administrator to establish and apply ocean dumping criteria. . . .

The text for Section 1.2 MARINE PROTECTION, RESEARCH AND SANCTUARIES ACT (1972) was taken from EPA/USACE. 1990. Draft *Dredged Material Disposal Strategy Document.* In preparation by Battelle Ocean Sciences and EA Engineering, Science, and Technology, Inc., and from EPA. 1990. Draft *Environmental Impact Statement for the Proposed Revisions Ocean Dumping Regulations for Dredged Material.* In preparation by Battelle Ocean Sciences and Science Applications International Corporation.

1.3 SECTION 404 OF THE CLEAN WATER ACT

An overview of the CWA Section 404 [(Pub. L. No. 95-217) (33 U.S.C. 1251 *et seq.*)] program and its regulatory requirements [*is*] presented in this Section. The CWA Section 404 regulates the discharge of dredged or fill material into navigable waters. . . . Navigable waters are defined in the CWA Section 502(7) as "the waters of the United States, including territorial seas." The waters of the United States for EPA and [*USACE*] purposes are defined in 40 CFR Part 230.3(s) and 33 CFR Part 328, respectively. The definitions are consistent with each other and extend to all waters, including lakes, streams, mudflats, and wetlands, "the use, degradation of which" could affect interstate or foreign commerce.

1.3.1 Geographic Jurisdiction

The ultimate responsibility for determining the scope of geographic jurisdiction of the CWA, including the Section 404 program ("waters of the United States"), lies with EPA.

. . . "[*W*]aters of the United States," includ[*e*]

- Waters that are currently used, were used in the past, or may be used in the future in interstate or foreign commerce
- All tidal waters
- All interstate waters and wetlands [*(including seasonal wetlands)*]

- All other waters (such as intrastate lakes, rivers, streams, and wetlands), if their use, degradation, or destruction could affect interstate or foreign commerce
- Tributaries to waters or wetlands identified above
- The territorial sea and
- Wetlands adjacent to waters (other than wetlands) identified above

Wetlands subject to regulation under CWA Section 404 are delineated by using a three-parameter approach: (1) positive indicators of wetlands vegetation, (2) hydrology, and (3) hydric soils.

1.3.2 Compliance with CWA Section 404(b)(1) Guidelines

The CWA Section 404(b)(1) Guidelines contain substantive environmental criteria used in evaluating discharges of dredged or fill material. The fundamental precept of these Guidelines is that "dredged or fill material should not be discharged into the aquatic ecosystem, unless it can be demonstrated that such a discharge will not have an unacceptable adverse impact either individually or in combination with known or probable impacts of other activities affecting the ecosystems of concern" [40 CFR 230.1(c)].

These Guidelines apply not only to CWA Section 404 permits issued by the [*USACE*] but also to [*USACE*] O&M programs and Civil Works projects involving the discharge of fill and dredged material. Compliance with these Guidelines has to be clearly demonstrated before any CWA Section 404 permit can be issued. There are several specific restrictions on discharges listed in 40 CFR 230.10.

One of the primary requirements of the Guidelines is that no discharge can be permitted when there is a practicable alternative with less adverse impact on the aquatic environment (unless the identified alternative poses other significant environmental problems)[40 CFR 230.10(a)]. This identification of practicable alternatives (that is [,] alternatives are presumed to exist) is applied more rigorously to projects that are proposed to be located in special aquatic sites when the project is not water-dependent. Special aquatic sites include wetlands, coral reefs, mud flats, riffle pool complexes in streams, vegetated shallows, and sanctuaries and refuges.

In addition, the discharge may not violate other applicable laws, such as State water-quality standards, toxic effluent standards, or the Endangered Species Act and Marine Sanctuaries designated under the MPRSA of 1972 [40 CFR 230.10(b)].

The third requirement states that all appropriate and practicable steps should be taken to minimize (i.e., mitigate) the adverse impacts of the discharge on the aquatic ecosystem, including providing for compensation for unavoidable impacts. These apply to both water- and nonwater-dependent activities.

A permit may also be denied if the activity will cause significant adverse effects on human health or welfare, including but not limited to effects on municipal water supplies, plankton, fish, shellfish, wildlife, and special aquatic sites; life stages of aquatic life and

other wildlife dependent on aquatic ecosystems; and aquatic ecosystems diversity, productivity, and stability; and recreational, esthetic, and economic values [40 CFR 230.10(c)]. . . .

1.3.3 Addressing Unacceptable Adverse Environmental Impacts

CWA Section 404(q)

EPA works with the [*USACE*] during the permit decision process whenever possible to ensure that unacceptable adverse impacts are avoided, and that most concerns are resolved through this interagency consultation. If EPA and the [*USACE*] are unable to resolve concerns through the interagency consultation, then the two agencies may use another resolution process, the Memoranda of Agreement (MOA) under CWA Section 404(q). This MOA is designed to resolve any differences over permit decisions. If the disputes are not resolved in the field, this MOA allows the EPA Assistant Administrator for Water to request that the Army's Assistant Secretary for Civil Works elevate the proposed permit decision to higher authority for review.

CWA Section 404(c)

Under this authority, EPA may prohibit, withdraw, or restrict disposal of dredged or fill material into waters of the United States if the discharge would have unacceptable adverse effects on municipal water supplies, shellfish beds and fishery areas (including spawning and breeding areas), wildlife, or recreational areas. The authority may be used before, during, or after [*USACE*] action on a permit application. EPA may also exercise this authority in the absence of a specified permit application or [*USACE*] regulatory action. The CWA 404(c) process includes requirements for notice, hearing, and consultation with the Secretary of the Army.

CWA Section 404(b)(2)

Under CWA Section 404(b)(2), if a site is disqualified by the application of the environmental criteria, the [*USACE*] is authorized to reexamine use of the site through a consideration of "the economic impact of the site on navigation and anchorage."

1.3.4 Enforcement

The enforcement authority, which is shared by the [*USACE*] and EPA, covers discharges without a permit and discharges in violation of the conditions of a permit. Under Section 309, the EPA Administrator has enforcement authority over anyone who discharges without a permit or is in violation of the terms of a permit. Under CWA Section 404(s), the [*USACE*] has enforcement authority over violators of [*USACE*]-issued permits.

It would appear that EPA and the [*USACE*] have overlapping enforcement authority. Because of the [*USACE*] larger field presence of the [*USACE*] and its role as the Federal permit-issuing authority and to avoid conflicts in enforcement authority, the EPA has focused its enforcement efforts on unpermitted discharges.

A division of responsibility was formalized in the 1989 Enforcement MOA. EPA is the lead enforcement agency (i.e., they determine what, if any, enforcement actions to pursue

are final) for unpermitted discharge cases. The [*USACE*] is the lead enforcement agency with regard to [*USACE*]-issued permit violations.

The text for Section 1.3 SECTION 404 OF THE CLEAN WATER ACT was taken from EPA/USACE. 1990. Draft *Dredged Material Disposal Strategy Document.* In preparation by Battelle Ocean Sciences and EA Engineering, Science, and Technology, Inc.

1.4 NATIONAL ENVIRONMENTAL POLICY ACT OF 1969

The NEPA [(Pub.L. No. 91-190) (42 U.S.C.4321 *et seq.*)] applies to major Federal actions [*significantly affecting the quality of the human environment*]. Actions coordinated by the [*USACE*] in the areas of dredging and disposal come under the NEPA jurisdiction. It is through the NEPA process that the alternatives of no action, ocean disposal, CWA Section 404 disposal, and upland disposal of dredged material are evaluated, documented, and publicly disclosed.

1.4.1 Goals of the National Environmental Policy Act

The NEPA was signed by the Congress on January 1, 1970, in recognition of man's profound effect on the natural environment. The Act establishes a national environmental policy with six goals:

- Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations
- Ensure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings
- Attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences
- Preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment that supports diversity and variety of individual choice
- Achieve a balance between population and resource use that will permit high standards of living and a wide range of life's amenities
- Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources

1.4.2 Requirements of the National Environmental Policy Act

The NEPA requires that government use all practicable means, consistent with the Act and other essential considerations of national policy, to fulfill the six goals. This requirement specifically applies to Federal agencies, their plans, regulations, programs, and facilities. The process that has been established under the guidelines of the NEPA

helps public officials to make decisions based on an understanding of their environmental consequences and to take actions that protect, restore, and enhance the environment. An important tool in this process is the preparation of a document that provides information about the environmental impact of a proposed action. This document is either an Environmental Impact Statement (EIS) or an Environmental Assessment (EA). . . .

1.4.3 EPA Review Authorities

Section 102(2)(A) of the NEPA requires agencies to use an interdisciplinary approach in their decision-making processes to ensure that environmental concerns receive adequate consideration. [*Under NEPA, EPA and other Federal agencies may comment on environmental documentation with regard to*] matters under which they hold jurisdiction by law or by special expertise. [*In addition,*] Section 309 of the Clean Air Act (CAA) specifically gives EPA the authority to oversee the environmental actions of other Federal agencies that may affect the environment [*by reviewing*] environmental documents prepared under the NEPA and mak[*ing*] the results of its review available to the public. When EPA finds a project to be environmentally unsatisfactory or the NEPA documentation inadequate, the agency can refer the project to the CEQ [*Council of Environmental Quality*] for a resolution. . . .

The text for Section 1.4 NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 was taken from EPA/USACE. 1990. Draft *Dredged Material Disposal Strategy Document.* In preparation by Battelle Ocean Sciences and EA Engineering, Science, and Technology, Inc.

1.5 OCEAN DUMPING REGULATIONS AND CRITERIA

The MPRSA gives the EPA Administrator and the Secretary of the Army authority to establish specific procedures and regulations for the issuance of permits under the ocean dumping permit program (MPRSA § 108, 33 USC 1418). In accordance with this authority, the EPA published its Ocean Dumping Regulations and Criteria on October 15, 1973, in Title 40 CFR Parts 220-227. These regulations were revised in 1977 in Title 40 CFR Parts 220-229 [*(Table 1-2). In addition to reflecting the statutory factors set forth in MPRSA Section 102(a), the ocean-dumping criteria and regulations*] are required to "apply the standards and criteria binding upon the United States under the [*London Dumping*] Convention, including its Annexes." The LDC forbids the dumping of dredged material containing prohibited materials (e.g., mercury, cadmium, or organohalogen compounds) other than as trace contaminants.

The [*USACE (in permitting) and the EPA (in its dredged-material permit-review role)*] must apply the ocean dumping [*regulations and*] criteria developed by the EPA to determine the acceptability of dredged material for ocean disposal. Materials that fail to pass these criteria may not be disposed of in the ocean without instituting controls or management actions to [*ensure that potential impact*] to the marine environment [*is acceptable*]. Proposed ocean disposal of dredged material must also comply with permitting and dredging regulations and criteria published by the [*USACE*] in Title 33 CFR Parts 209, 320-330, and 335-338.

Table 1-2. Contents of Title 40 CFR Parts 220-229 – Ocean Dumping. [From EPA 1990. Working Draft *Site Designation, Monitoring, and Management Guidance for Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Tetra Tech, Inc.]

Part	220	GENERAL Purpose and scope; definitions; categories of permits; authority to issue permits
	221	APPLICATIONS FOR OCEAN DUMPING PERMITS UNDER SECTION 102 OF THE ACT Applications for [*EPA-issued*] permits; adequacy of information; fees
	222	OCEAN DUMPING PERMIT APPLICATIONS UNDER SECTION 102 OF THE ACT [*EPA*] Tentative determinations; notice of applications; hearings; recommendations; issuance of permits; appeals
	223	CONTENTS OF PERMITS; REVISION, REVOCATION OR LIMITATION OF OCEAN DUMPING PERMITS UNDER SECTION 104d OF THE ACT Contents of various [*EPA-issued*] permits; revising, revoking, or limiting permits; hearings
	224	RECORDS AND REPORTS REQUIRED OF OCEAN DUMPING PERMITTEES UNDER SECTION 102 OF THE ACT Records to maintain; reports to file [*by EPA permittees*]
	225	CORPS OF ENGINEERS DREDGED MATERIAL PERMITS Review of dredged material permits; procedure for [*waiver requests by USACE*]
	227	CRITERIA FOR EVALUATION OF PERMIT APPLICATIONS FOR OCEAN DUMPING OF MATERIALS Criteria for evaluating environmental impacts; criteria for evaluating the need for ocean dumping and alternatives; impact on esthetics, recreational and economics; impact on other ocean uses; requirement for interim permits
	228	CRITERIA FOR THE MANAGEMENT OF DISPOSAL SITES FOR OCEAN DUMPING Site management responsibilities; procedures for designating sites; criteria for selection of sites; times and rates of disposal; monitoring; evaluating impacts; modification of site use; delegation of authority for interim sites; baseline and trend assessment surveys
	229	GENERAL PERMITS Burial at sea; transportation of vessels and disposal of vessels

Title 40 CFR Parts 225 and 227 include criteria to be considered in the evaluation of applications for dredged material disposal permits. Part 225 [*specifically addresses the permitting of*] proposed ocean disposal of dredged material. [*Sections of*] Part 227 [*establish*] the requirements that apply to dredged material technical evaluations and contains procedural requirements for the evaluation of all dredged material proposed for ocean disposal. These rely heavily on biological assessments. A manual was published in 1977 jointly by the EPA and the [*USACE*] to describe the biological tests. . . . This manual has been updated in the *Draft Ecological Evaluation of Proposed Discharge of Dredged Material into Ocean Waters.* . . . [*Those*] sections of Part 227 applicable to dredged material evaluation [*are specifically identified in the regulations*].

The regulations published by the [*USACE*] to establish criteria for the evaluation of permit applications and the issuance of permits (33 CFR 209, 320-330, and 335-338) emphasize evaluation techniques such as bioassays and bioassessments that estimate the potential for environmental impact of dredged material disposal similar to the 40 CFR requirements. Dredged material evaluated under testing procedures and found to comply with the regulations may be disposed, under permit, at a designated ocean dredged material disposal site if it satisfies all other applicable requirements of 40 CFR Parts 220-229, the terms and conditions of the site designation, and the requirements of 33 CFR Parts 320-330 and 335-338.

The dredged material regulations make a distinction between the criteria for uncontaminated dredged material and those for contaminated dredged material (40 CFR § [2]27.13). This distinction simplifies the evaluation procedures for dredged material that could be classified as uncontaminated and limits the amount of information that would have to be compiled to characterize these materials. In brief, [*such*] dredged material is (1) composed predominantly of naturally occurring bottom material larger than silt and is in areas of high current or wave energy, (2) [*used*] for beach nourishment or restoration and is of a particle size compatible with the receiving beach, or (3) [*composed*] of the same substrate as the receiving site and is sufficiently removed from known sources of pollution so as to reasonably ensure that the material is not contaminated. If these criteria are not met, [*more extensive*] testing is required. If a potential for unacceptable adverse environmental impacts is identified, a case-by-case evaluation of management options is necessary. If ocean dumping is to be pursued, attention should be given to using restrictive disposal techniques to minimize or eliminate potentially adverse impacts to the marine environment. . . .

The text for Section 1.5 OCEAN DUMPING REGULATIONS AND CRITERIA was taken from EPA. 1990. Working Draft *Site Designation, Monitoring, and Management Guidance Document for Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Tetra Tech, Inc.

EPA RESEARCH

A Means to Evaluate Dredged Material and Implement Ocean Dumping Regulations

2.0 EPA RESEARCH

EPA conducts research on dredged material and the environmental effects of its disposal at the EPA Environmental Research Laboratories in Narragansett, Rhode Island, and Newport, Oregon; the Office of Research and Development (ORD) Environmental Research Laboratory in Gulf Breeze, Florida; and at numerous university and contract laboratories. Current projects include

- Development of chronic-test amphipod bioassays
- Comparison of new "Green Book" *(Draft Ecological Evaluation of Proposed Discharge of Dredged Material into Ocean Waters)* and old "Green Book" tests
- Development of physical transport models for fate and effects evaluation of dredged material
- Studies for the development of sediment-quality criteria
- Evaluation of trophic transfer of contaminants from sediments

In addition to publications in scientific journals and the documents excerpted in this paper, EPA sponsors the publication of documents on sediment assessment and dredged-material disposal. A partial list of these documents follows.

- EPA/USACE Technical Committee on Criteria for Dredged and Fill Material. 1981. *Procedures for Handling and Chemical Analysis of Sediment and Water Samples.* EPA-4805572010.

- EPA. 1989. *Assessing Human Health Risks from Chemically Contaminated Fish and Shellfish – A Guidance Manual.* EPA-503/8-89-002.

- EPA Environmental Research Laboratory Pacific Ecosystems Branch Bioaccumulation Team. 1990. *Guidance Manual: Bedded Sediment Bioaccumulation Tests.* EPA/600/x-89/302, ERLN-N111.

- EPA Environmental Research Laboratory Pacific Ecosystems Branch Bioaccumulation Team. 1990. *Computerized Risk and Bioaccumulation System.* ERLN-137.

- PTI Environmental Services. 1989. *Comparison of Bioassays for Assessing Sediment Toxicity in Puget Sound.* Final report for the U.S. Environmental Protection Agency Puget Sound Estuary Program. EPA 910/9-89-004.

- PTI Environmental Services. 1990. *Effects of Sediment Holding Time on Sediment Toxicity.* Draft report for the U.S. Environmental Protection Agency, Seattle, WA.

- PTI Environmental Services. 1990. *Development of a* Neanthes *Sediment Bioassay for Use in Puget Sound.* Final report for the U.S. Environmental Protection Agency Puget Sound Estuary Program. EPA 910/9-89-005.

- Tetra Tech. 1985. *Bioaccumulation Monitoring Guidance: 3. Recommended Analytical Detection Limits.* EPA Contract No. 68-01-6938, TC-3953-03. Final report for the U.S. Environmental Protection Agency, Office of Marine and Estuarine Protection, Marine Operation Division, WH-556M, Washington, DC.

- Tetra Tech. 1986. *Bioaccumulation Monitoring Guidance: 4. Analytical Methods for U.S. EPA Priority Pollutants and 301(h) Pesticides in Estuarine and Marine Organisms.* EPA Contract No. 68-01-6938, TC-3953-03. Final report for the U.S. Environmental Protection Agency, Office of Marine and Estuarine Protection, Marine Operations Division, WH-556M, Washington, DC.

- Tetra Tech. 1986. *Analytical Methods for U.S. EPA Priority Pollutants and 301(h) Pesticides in Estuarine and Marine Sediments.* EPA Contract No. 68-01-6938, TC-3953-03. Final report for the U.S. Environmental Protection Agency, Office of Marine and Estuarine Protection, Marine Operations Division, WH-556M, Washington, DC.

SITE DESIGNATION

3.0 SITE DESIGNATION

3.1 INTRODUCTION

The MPRSA authorizes the EPA Administrator to designate ocean dredged-material disposal sites (ODMDS). The authority to designate such sites extends to dredged-material disposal sites. Two categories of sites may be designated under the MPRSA: interim and final sites. Approximately 65 million cubic yards per year of dredged material are disposed of at 104 (45 interim and 59 final) designated sites. Interim sites were designated by EPA following MPRSA enactment on the basis of their historical usage, and thereafter are subject to environmental reviews. A site is designated as interim until all the required environmental studies and reviews have been conducted to determine if the environmental criteria, as stated in the Ocean Dumping Regulations and Criteria, have been met. If the criteria are met, the site is designated as an approved final designation site.

> [*The site designation process begins with a request from the USACE to designate a site for disposal of dredged material. The EPA and the COE work together to select and designate ocean dredged material disposal sites (ODMDS) [33 CFR 320.2 (g)].*] . . . Although, according to MPRSA § 103(b), the Secretary of the Army is to conduct an independent assessment of appropriate disposal sites for dredged material, the Secretary is directed to utilize, to the extent feasible, sites recommended by the EPA under § 102(c). . . . In cases where a recommended disposal site has not been designated by the Administrator, the COE District Engineer may, in consultation with the EPA, select a site in accordance with the requirements of 40 CFR § 228.5 and § 228.6(a). Concurrence by the EPA in permits issued for the use of such site for the dumping of dredged material constitutes EPA approval of the use of the site for dredged material disposal [40 CFR § 228.4(e)(2)]. . . .
>
> The text for Section 3.1 INTRODUCTION was taken from EPA. 1990. Working Draft *Site Designation, Monitoring, and Management Guidance Document for Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Tetra Tech, Inc.

3.2 REGULATORY CRITERIA AND ADMINISTRATIVE PROCEDURES

Pursuant to MPRSA § 102, the EPA has promulgated regulations governing ocean disposal site designation as part of its Ocean Dumping Regulations and Criteria [*40 CFR Part 228. Under MPRSA § 103(b), the Secretary of the Army is to utilize EPA-designated sites to the extent feasible.*] . . . The criteria and procedures for the designation of ocean disposal sites for use under dredged-material permits are described in detail in Part 228 of the Ocean Dumping Regulations. As defined in 40 CFR § 228.2(a), "disposal site" refers to an interim or finally approved and precise geographical area within which ocean dumping of wastes is permitted under conditions specified in permits issued under § 102

and § 103 of the Act. Site designation refers to the promulgation of a rule pursuant to 40 CFR Part 228 that specifies an ocean disposal site according to precise geographic coordinates.

Designation of a disposal site refers only to the formal selection of a site for ocean disposal under dredged material ocean disposal permits. Designation of a site does not authorize the dumping of material at the site. . . . Dumping at any designated site may take place only after a permit authorizing such dumping has been issued. The permit identifies the dredged material and [*may set*] limits on the times, rates, and methods of disposal and quantities of materials that may be dumped. [*In addition, the site designation itself may contain restrictions on the type of material or amounts that may be disposed of at the site.*]

Site designation for ocean disposal of dredged material will be made based on environmental studies of the site, regions adjacent to the site, and on historical knowledge of the impact of dredged material disposal on areas similar to such sites in physical, chemical, and biological characteristics [40 CFR § 228.4(e)(1)]. . . .

. . . Sites designated or redesignated for dredged material ocean disposal are chosen based on specific criteria designed to minimize adverse impacts on the marine environment detailed at 40 CFR § 228.5 and § 228.6 as appropriate. The [*five*] general criteria identified by § 228.5 for the selection of sites are . . .

(a) The dumping of materials into the ocean will be permitted only at sites or in areas selected to minimize the interference of disposal activities with other activities in the marine environment, particularly avoiding areas of existing fisheries or shellfisheries, and regions of heavy commercial or recreational navigation.

(b) Locations and boundaries of disposal sites will be so chosen that temporary perturbations in water quality or other environmental conditions during initial mixing caused by disposal operations anywhere within the site can be expected to be reduced to normal ambient seawater levels or to undetectable contaminant concentrations or effects before reaching any beach, shoreline, marine sanctuary, or known geographically limited fishery or shellfishery.

(c) If[,] at any time during or after disposal site evaluation studies, it is determined that existing disposal sites presently approved on an interim basis for ocean dumping do not meet the criteria for site selection set forth in § 228.5 through § 228.6, the use of such sites will be terminated as soon as suitable alternate disposal sites can be designated.

(d) The sizes of ocean disposal sites will be limited in order to localize for identification and control any immediate adverse impacts and to permit the implementation of effective monitoring and surveillance programs to prevent adverse long-range impacts. The size, configuration, and location of any disposal site will be determined as a part of the disposal site evaluation or designation study.

(e) EPA will, wherever feasible, designate ocean dumping sites beyond the edge of the continental shelf and other such sites that have been historically used. . . .

[*The 11 specific criteria to be considered for the selection of sites identified by § 228.6(a) are*]

- Geographical position, depth of water, bottom topography, and distance from coast
- Location in relation to breeding, spawning, nursery, feeding, or passage areas of living resources in adult or juvenile phases
- Location in relation to beaches and other amenity areas
- Types and quantities of wastes proposed to be disposed of, and proposed methods of release, including methods of packing the waste, if any
- Feasibility of surveillance and monitoring
- Dispersal, horizontal transport, and vertical mixing characteristics of the area, including prevailing current direction and velocity, if any
- Existence and effects of current and previous discharges and dumping in the area including cumulative effects
- Interference with shipping, fishing, recreation, mineral extraction, desalination, fish and shellfish culture, areas of special scientific importance and other legitimate uses of the ocean
- The existing water quality and ecology of the site as determined by available data or by trend assessment or baseline surveys
- Potentiality for the development or recruitment of nuisance species in the disposal site
- Existence at or in close proximity to the site of any significant natural or cultural features of historical importance. . . .

. . . Other factors such as a comparison of short-term uses versus long-term productivity of the site and the extent of irreversible and irretrievable commitments of resources by selection of the site may be of importance in the evaluation of potential disposal sites. To protect critical areas, the EPA Administrator . . . , in consultation with the COE, designate sites or times within which certain materials may not be dumped [MPRSA § 102(c), 33 USC 1412(c)].

. . . A national Memorandum Of Understanding (MOU) has been established between the EPA and the COE for the purpose of facilitating implementation of the MPRSA requirements that these agencies ensure that ocean dredged material disposal activities will not unreasonably degrade the marine environment or endanger human health (Memorandum of Understanding Between the Department of the Army and Environmental Protection Agency, 27 July 1987). Locating and designating appropriate ocean disposal sites and subsequent management of disposal activities at these sites are essential elements in meeting this shared legislative mandate. The national MOU establishes the basis for cooperative effort and funding between the EPA and COE for final designation and management of ocean dredged material disposal sites in three categories. Future sites may be added by mutual consent of the agencies. . . .

. . . The national MOU . . . directs the EPA regions and the COE Coastal Divisions, or their designated districts, to develop and implement individual cooperative MOUs that (1) delineate regional implementation plans for ocean dredged material disposal site designations and subsequent site management and (2) include monitoring as appropriate.

Regional MOUs are to establish priorities for work, milestones and schedules for implementation, agreements for allocation of the EPA and the COE resources, and other related activities and management initiatives to carry out the requirements of the national MOU. Regional MOUs are to be developed and implemented in accordance with existing regulations and guidance and the procedures set forth in the national MOU for site designation and site management. . . .

The text for Section 3.2 REGULATORY CRITERIA AND ADMINISTRATION PROCEDURES was taken from EPA. 1990. Working Draft *Site Designation, Monitoring, and Management Guidance Document for Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Tetra Tech, Inc.

3.3 TECHNICAL GUIDANCE FOR ODMDS DESIGNATION

. . . The logical process for [*site designation (Figure 3-1)*], which is a series of analyses of increasing complexity, is fashioned after the tiered approach of Zeller and Wastler (1986). . . . The general purpose of the tiered approach is to eliminate sites at which unacceptable ecological impacts are probable. Tiering of the information and the decision-making process provides an efficient, cost-effective means of conducting the site-selection process. . . . The tiering approach is cost-effective because the tiers are ordered by increasing levels of complexity, effort, and cost. For example, the locations of major shellfish areas are routinely mapped (in many cases) by local resource agencies, and such information typically is available at a low cost. A candidate disposal site could be eliminated from consideration quickly and inexpensively in a nearfield assessment if it was found to include a major shellfishing area. Alternatively, a farfield assessment of whether toxic substances in a waste material have the potential to contaminate a shellfish bed downcurrent from the candidate disposal site would require detailed information on hydrography, contaminant loadings, and anticipated chemical reactions at the disposal area; predictions of offsite transport; and predictions of the probable degree of bioaccumulation. Such information is very costly to collect and analyze. Because the tiers are arranged in order of increasing cost, they do not correspond to any gradient of impact severity. The most severe impact at a given site could be within any of the three tiers. . . .

. . . The information gathered at each tier must provide the answer to a question(s) specific to the selection and designation of an ocean disposal site. This will enable conclusions to be reached at the end of each tier, as well as a management decision on whether to either accept or reject the designation of a site, or whether to continue through the remainder of the selection process. The tiering concept represents a logical progression in the types of both qualitative and quantitative data necessary to the decision making process. . . .

. . . The site-designation process [*is*] terminated early only if it can be shown that an alternative disposal method is less expensive and has lower potential for adverse impacts on the total environment. The site-designation process also includes a preliminary judgment of the technical-feasibility factors and socioeconomic factors affecting the use of a site. [*T*]hese factors are discussed in the *Dredged Material Disposal Strategy Document.* . . .

Areas that should be eliminated from consideration either because of conflicting uses or because of the sensitivity of the receiving environment are also identified early in the

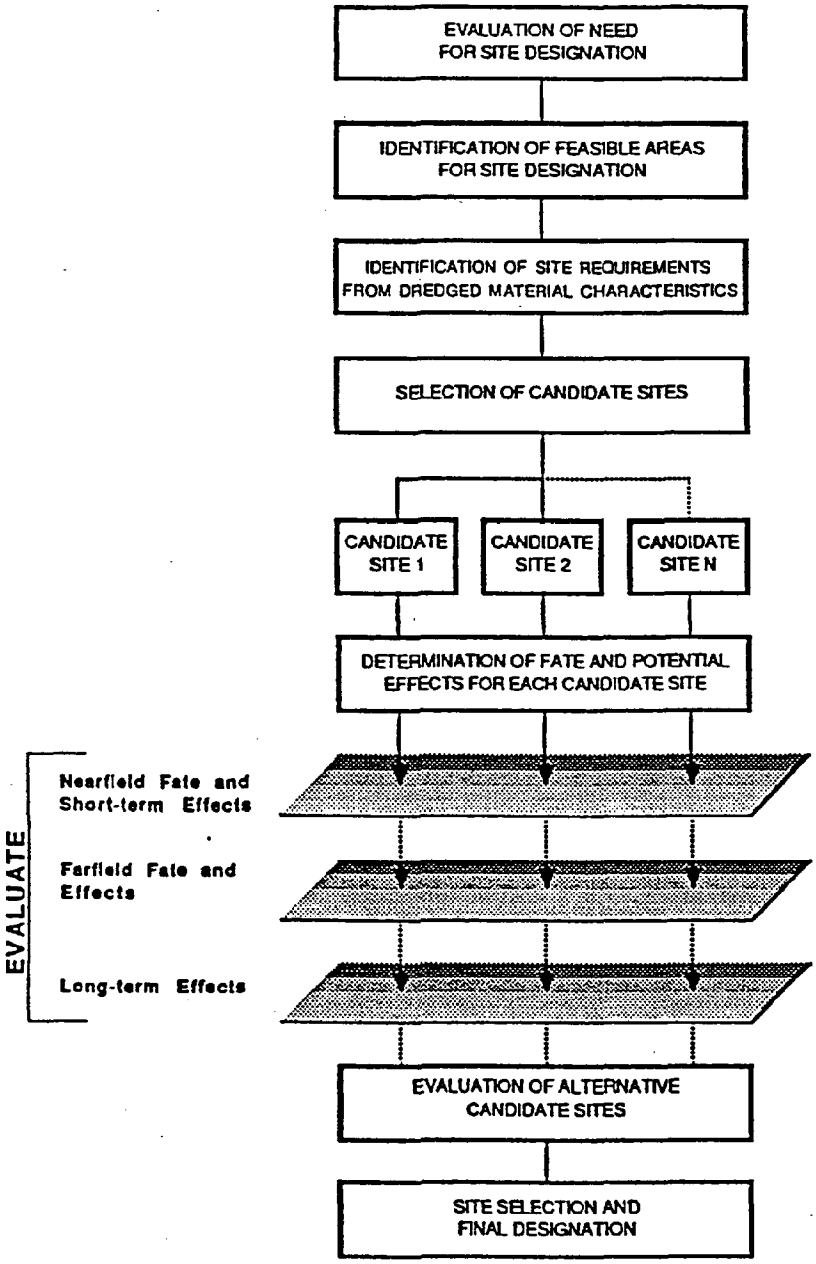


Figure 3-1. Flow Chart and Major Components of the Site Selection Process. [From EPA. 1990. Working Draft *Site Designation, Monitoring, and Management Guidance for Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Tetra Tech, Inc.]

site-designation process. . . . When one or more candidate sites can still be identified within an area of the ocean as suitable for disposal, guidelines are provided on the selection of appropriate candidate sites. . . .

It will generally be desirable to identify two or more candidate sites (including, wherever feasible, at least one site off the continental shelf). Because the more detailed analyses . . . are designed to assess the relative degree of impact under different sets of conditions, it is more difficult to predict the absolute magnitude of an impact at a single site than it is to assess the relative impacts at two or more candidate sites. Certain characteristics of the candidate sites may eliminate one or more of these sites from consideration. For example, ambient water quality may already exceed criteria or standards, or hydrographic characteristics of a site may be such that dilution will be insufficient to allow dumping at the site. Certain characteristics of the sediments and resident biological communities may also indicate that the site is a poor choice for disposal of the dredged material under consideration. . . .

. . . The tiering [*approach*], as applied to site designation, is illustrated best at the level of site information necessary to determine the potential effects of dredged material disposal on each candidate site. . . . At this level, each candidate site is evaluated first for nearfield fate and short-term effects, then for farfield fate and effects, and finally for long-term effects. The evaluation is conducted stepwise, beginning with the short-term effects. If, for any one of the candidate sites, comparing dredged material characteristics to site information should indicate that there will be significant deleterious effects, that site may be dropped from further evaluation and consideration. . . .

. . . Comparisons among existing and possible future sites for ocean disposal are one method by which site selections can be made. Characteristics of candidate sites may be compared with characteristics of existing disposal sites to determine whether they are sufficiently similar to reasonably predict possible impacts at the candidate sites based on known impacts at the existing sites. Comparisons with sites in other regions that were selected for consideration but were not designated can also be instructive. Such comparisons may reveal one or more common characteristics that resulted in elimination of the previously considered site from the site-designation process. Finally, comparisons among all candidate sites may help to ensure that the designated site is one of the sites where the least impact is expected.

. . . The tiered assessment probably will be performed twice for most sites that achieve final designation. The first assessment should be performed by using information available from published and unpublished reports, research institutions, and government agencies. The level of detail of this initial assessment will necessarily be determined by the quantity and quality of the existing data. It is probable that available information will be incomplete for most candidate sites. Exceptions might include sites previously used or previously considered for ocean dumping. The second assessment should be performed after baseline data are collected at the candidate site, but before final site designation . . . . Baseline information will be needed for most selected sites to ensure that unacceptable impacts are not incurred because site characteristics are poorly known. Examples of site characteristics that might not be known prior to selection of candidate sites, but that might prohibit a candidate site from being designated, include the periodic occurrence of erosional events (at a site targeted for materials that should not be dispersed) and the intense seasonal use of a selected site by commercially important species of fish or shellfish. . . .

The ODMDS-designation process comprises the following sequence of major components. Also listed is the section in which the component is discussed.

1. Determine if there is a need for an ocean disposal site [*Evaluation of Need for Site Designation*]

   Productive uses and initial characterization of dredged material are also part of determining the need for site designation.

2. Identify areas of the ocean where dredged material disposal could be allowed [*Identification of Areas Suitable for Site Designation*]

3. Determine the general site characteristics (e.g., size, location, seasonal restrictions) [*Identification of ODMDS Requirements Related to Dredged Material Characteristics*] based on an evaluation of the characteristics of the dredged material proposed for ocean disposal [*Dredged Material Initial Characterization, under component 1.*]

4. Select candidate sites within suitable areas for further evaluation [*Candidate Sites*]

5. Determine the fate and potential effects of the dredged material proposed for disposal at selected candidate sites [*Determination of Fate and Potential Effects for Each Candidate Site*]

6. Evaluate the suitability of the alternative candidate sites, based on predicted fate and effects of dredged material proposed for ocean disposal [*Evaluation of Candidate Sites*]

7. Select one or more candidate sites for final designation for ocean disposal [*Site Selection and Final Designation of an ODMDS*] . . . .

The text for Section 4.2 TECHNICAL GUIDANCE FOR ODMDS DESIGNATION was taken from EPA. 1990. Working Draft *Site Designation, Monitoring, and Management Guidance Document for Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Tetra Tech, Inc.

3.3.1 Evaluation of Need for Site Designation

. . . The site-designation process is initiated after the need has been demonstrated for consideration of ocean dumping as an acceptable alternative for dredged material disposal. . . . The demonstration of need [*typically*] originate[*s*] with the COE and [*is*] based on expectations of future dredging operations. . . .

As part of the evaluation of need for an ocean disposal site, the quantities of dredged material proposed for ocean disposal must be estimated. The frequency of disposal and the period over which disposal is expected must also be estimated. In some cases, these values can be estimated accurately.

The text for Evaluation of Need for Site Designation was taken from EPA. 1990. Working Draft *Site Designation, Monitoring, and Management Guidance Document for Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Tetra Tech, Inc.

Productive Uses of Dredged Material

. . . Dredged materials that have the appropriate physical and chemical characteristics can be used for a number of productive purposes in the aquatic environment. The most common applications are beach nourishment and habitat enhancement.

Beach Nourishment

Beach nourishment consists of placing uncontaminated materials of appropriate grain sizes on beaches to replace losses from erosion or to increase beach expanse or elevation to enhance shoreline protection. This is a common practice along ocean, estuarine, and lake coast lines, and it has proven very successful with uncontaminated materials of grain sizes similar to those naturally occurring on the beach to be nourished. This process tends to be both environmentally acceptable and cost-effective when the dredging sites are relatively nearby . . . and the dredged material has appropriate chemical and physical characteristics.

Another application, which is under development, consists of placing a submerged berm just off the shore of a beach. The berm can be designed to reduce wave erosion of the beach and to provide "feedstock material" that will be gradually moved onto the beach by natural sediment-transport mechanisms. . . . The grain sizes and physical and chemical characteristics of the materials for use in a berm must be similar to those that would be required of materials that are to be placed directly on the beach.

Habitat Creation

While aquatic disposal has seldom been used expressly to create habitats, it has often been observed that aquatic disposal sites can be attractive to aquatic organisms. This attraction can be enhanced when sites are selected and managed to create relief and topographic variety on an otherwise uniform bottom. . . . Such topographical variety can be maintained by periodic disposal at sites in erosional areas, and can be expected to endure for long periods from single disposal operations in depositional environments. Uncontaminated materials of any grain size can be used for aquatic-habitat enhancement under appropriate site conditions. . . .

The text for Productive Uses of Dredged Material was taken from EPA/USACE. 1990. Draft *Dredged Material Disposal Strategy Document.* In preparation by Battelle Ocean Sciences and EA Engineering, Science, and Technology, Inc.

Dredged Material Initial Characterization

. . . The [*physical*] characteristics of the dredged material [*must be considered*] in evaluating . . . ocean disposal alternative, since they will affect the potential dilution, dispersion, accumulation, and environmental effects of the dredged material. Dredged material typically is composed of sand, silt, and clay mixtures. Contaminant concentrations in dredged material are highly variable and are dependent on the dredging-site proximity to historical and recent pollution sources and on the nature of those sources. [*Thus, in designating sites, the types of dredged material likely to be disposed at the candidate site need to be considered.*]

The text for Dredged Material Initial Characterization was taken from EPA. 1990. Working Draft *Site Designation, Monitoring, and Management Guidance Document for Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Tetra Tech, Inc.

3.3.2 Identification of Areas Suitable for Site Designation

The site-designation criteria presented in the Ocean Dumping Regulations (Part 228) provide the framework for developing the graphical overlays. Ecological factors and a wide range of existing uses of the ocean are mapped to identify areas for ocean dumping that do not present apparent conflicts with uses of the ocean or living marine resources of the general area. The following steps are required to identify suitable areas for site designation. . . :

- Define the large-scale ocean region potentially suitable for ocean disposal site(s), the Zone of Siting Feasibility (ZSF).
- Prepare base maps of the Zone of Siting Feasibility.
- Compile information and prepare composite overlay maps for biological resources and areas of incompatible uses.
- Identify suitable subareas for site designation.

The initial step in identifying suitable areas for site designation is to determine the general area considered feasible for location of an ocean disposal site. The proposed regulations do not provide specific guidelines for defining this general area under consideration. The EPA/COE report (1984) discusses factors to be considered in selection of this general area, called a ZSF. Important factors that should be evaluated include navigational restrictions, political boundaries, distance to the edge of the continental shelf, the feasibility of monitoring and surveillance, and, [*as necessary*], operational and transportation costs. In most instances where this approach has been used for siting dredged material disposal sites, the ZSF has been circumscribed by a radial distance from the origination point (i.e., port or dredge site) whose maximum length is fixed by economic considerations. However, the shape of the ZSF does not have to be that of a circumscribed area based on operational costs. It may take any initial shape and size based on the other noncost factors listed above. In any case, the ZSF being evaluated should extend off the continental shelf, wherever feasible, as required in the ocean dumping regulations [§ 228.5(e)] [*and MPRSA § 102(a)(I)*]. . . .

. . . By using the base maps of the area, information should be compiled and mapped to characterize biological resources and uses of the ocean. Information to be mapped includes (1) living resources; (2) ecologically significant habitats (including those of endangered or threatened species); (3) various commercial, recreational, and military uses; and (4) areas of cultural or historical significance. . . . The approach presented [*herein*] is to identify potential ocean disposal areas that would avoid sensitive biological resources and areas in which ocean disposal activities would be incompatible with present uses. . . .

. . . Information on recreational and commercial fisheries (including shellfish resources) is to be compiled to characterize the spatial distribution of fishery resources, areas of fishing intensity, and the relative economic importance of the fishery in the region. . . .

[*In addition, use conflicts must also be evaluated, especially for on the Continental Shelf disposal sites.*] Many activities are concentrated on the continental shelf, including shipping, commercial and recreational fishing, surface and subsurface military activities, etc. These require that disposal sites on the shelf be carefully selected to minimize potential conflicts. This can be a time-consuming and difficult task in some areas. . . .

. . . Recreational uses of coastal areas (e.g., swimming and boating) may also vary seasonally. By contrast, many of the other uses of the ocean [*do*] not vary seasonally. Navigation lanes, drilling platforms, undersea cables and pipes, and mineral extraction activities represent fixed uses of the ocean that could conflict with ocean dumping. Areas used for such purposes [*may need*] to be mapped as unsuitable for site designation. . . .

. . . Information on biological resources and areas of incompatible uses is mapped onto a series of common scale maps, based on the National Oceanic and Atmospheric Administration/National Ocean Survey (NOAA/NOS) nautical charts for the area. Each area to be avoided is then mapped individually to produce a composite overlay map [*Figure 3-2*]. Locations on this composite map that do not intersect areas to be avoided are then identified as potentially suitable areas for site designation. . . .

The text for Dredged Material Initial Characterization was taken from EPA. 1990. Working Draft *Site Designation, Monitoring, and Management Guidance Document for Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Tetra Tech, Inc.; and from EPA/USACE. 1990. Draft *Dredged Material Disposal Strategy Document.* In preparation by Battelle Ocean Sciences and EA Engineering, Science, and Technology, Inc.

3.3.3 Identification of ODMDS Requirements Related to Dredged-Material Characteristics

. . . The characteristics of the dredged material to be dumped in ocean waters are important determinants of specific requirements relating to characteristics of the designated disposal site. Characteristics that should be considered in determining site requirements include the volume of the dredged material, physical properties, . . . [*and potential chemical contamination that might require specific management actions if dredged material disposal is to proceed*].

Dredged material characteristics can be obtained from the physical and environmental testing necessary to evaluate proposed disposal operations. . . . Dredged material can cover a wide spectrum of physical characteristics from rock and gravel through sands to very fine, high-water-content silts and clays. It can range from being contaminant-free to being contaminated with a variety of chemicals of environmental concern. The dissolved, suspended particulate and solid fractions of the dredged material will encounter different fates upon disposal and thus must be treated differently in the determination of site requirements.

The characteristics of the dredged material will determine the most appropriate disposal strategy and site management strategy. This will, in turn, determine suitable locations for the disposal site. To minimize the potential for adverse environmental impacts, the physical, chemical, and biological characteristics of the dredged material must be carefully matched to those of potential disposal sites applying sound ecological principles.

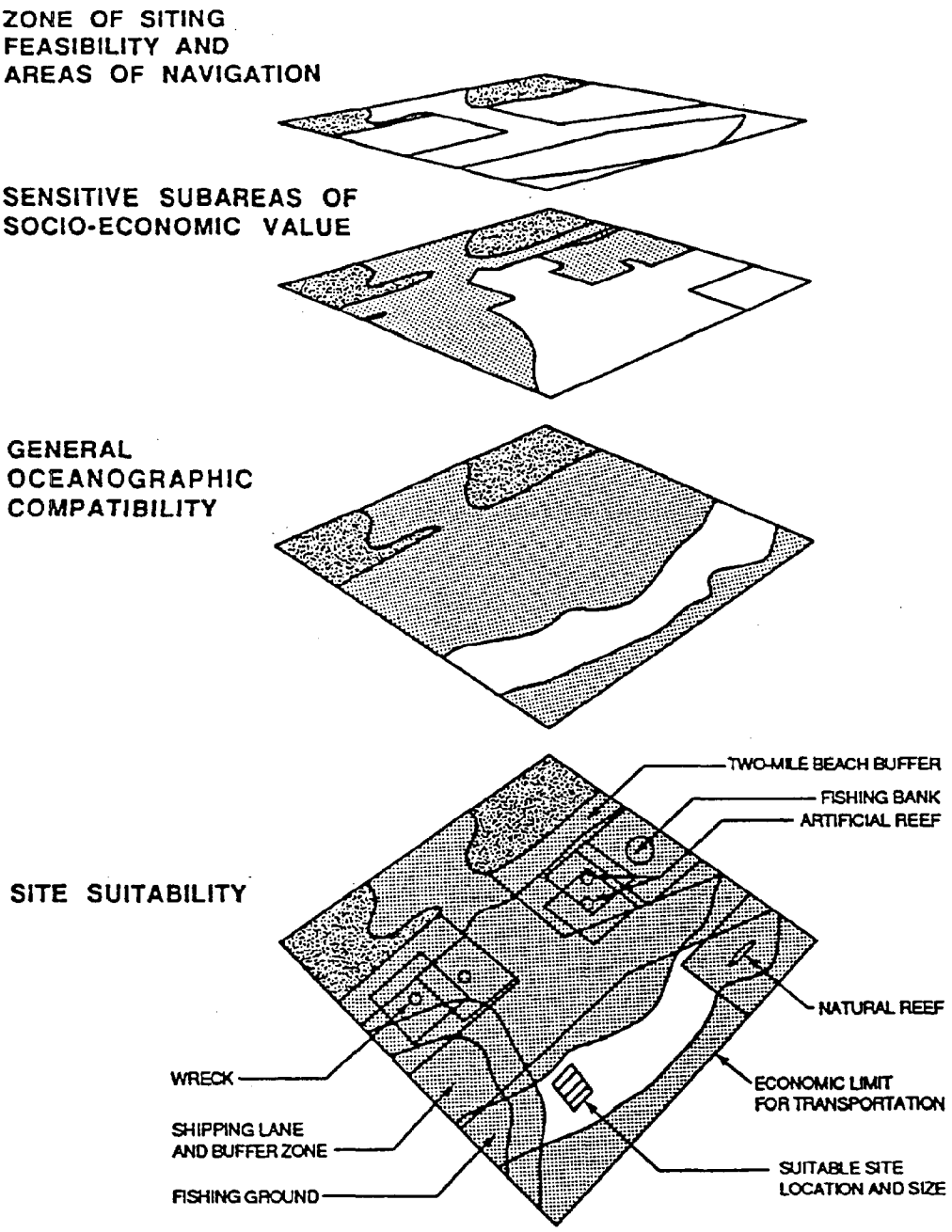


Figure 3-2. Schematic Overlay Process for Screening Out Sensitive and Incompatible Use Areas. [From EPA/USACE. 1984. *General Approach to Designation Studies for Ocean Dredged Material Disposal Sites.*]

Dredged material disposal sites within the jurisdiction of the MPRSA can range from deep-ocean sites off the continental shelf to shallow coastal sites on the continental shelf. Dredged material disposal sites may be selected and managed to either maximize or minimize dispersion of the material placed at the site. Selection of dispersive or retentive sites depends on case-by-case evaluation of a number of factors related to the physical, chemical, and biological characteristics of the dredged material and of the disposal site. . . .

The selection of sites for the disposal of dredged material that is considered unacceptable for open-ocean disposal[,] because of potential toxicity and bioaccumulation effects[,] [*would be*] approved for disposal [*only*] with management action [*(e.g., disposal techniques) to render impacts of dredged-material disposal acceptable*]. . . . [*These sites*] will necessarily be selected for their ability to contain the disposed material with the aid of disposal techniques that will reduce water column and benthic effects.

Site requirements specifically related to the nature of the dredged material may include the minimum site area and various oceanographic conditions such as depth, wind and current regimes, and density profiles in the water column. These characteristics are important for determining the dilution and dispersion that will occur after the material is dumped, and thereby for determining that ocean disposal at the designated site can meet applicable regulatory criteria (e.g., water-quality criteria). . . .

. . . [*A*] screening procedure . . . [*can be*] used to identify site requirements that are related to dredged material characteristics. The first step is to determine dredged material dilution requirements necessary to meet water-quality criteria and other regulatory criteria. . . . [*P*]ermitting regulations are used as general guidelines in calculations for dilution requirements. From results of the dilution requirement calculations, a preliminary evaluation [*can be*] made to determine if the material is acceptable or unacceptable for ocean dumping[,] . . . based on a criterion of 10^4 for the maximum dilution achievable during initial mixing. In cases where required dilutions are less than 10^4 for all dredged material constituents, the dilution expected during initial mixing is calculated to determine if the required dilution can be achieved. If the required dilution is determined to be achievable, the minimum size for potential disposal sites is calculated. An estimate of flushing requirements for potential disposal areas is then made by considering the cumulative effects of multiple dumps. . . .

The screening evaluations for site designation should be conducted[,] to the maximum extent possible, using available information on dredged material characteristics. Where more detailed information is necessary to continue the site-selection process, actual dredged material characteristics may have to be determined, or conservative estimates . . . employed for site designation evaluations. . . .

The text for Identification of ODMDS Requirements Related to Dredged Material Characteristics was taken from EPA. 1990. Working Draft *Site Designation, Monitoring, and Management Guidance Document for Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Tetra Tech, Inc.

3.3.4 Candidate Sites

Candidate sites for ocean disposal are selected based on the following criteria:

- The siting requirements resulting from calculations made in [*the Identification of Dredged Material Characteristics Section*]
- The appropriate dredged material disposal strategy [*to minimize environmental impact*]
- Application of general guidelines [*(1) site, size, and location requirements; (2) expected disposal strategy; (3) consideration of other general criteria*]

The underlying principles guiding the selection of candidate sites [*would*] be the general criteria of [*the regulations (40 CFR § 228.5 9a-e).*] Prior [*to final evaluation of the*] general and specific criteria [*40 CFR § 228.6 (a)(1-11)*], however, a decision should be made regarding the dredged material disposal strategy (i.e., dispersive versus nondispersive) likely to be employed. This decision will affect the selection of candidate sites.

The text for Candidate Sites was taken from EPA. 1990. Working Draft *Site Designation, Monitoring, and Management Guidance Document for Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Tetra Tech, Inc.

Selection of Dredged Material Disposal Strategy: Dispersive versus Nondispersive

Based on the results of the evaluation of dredged material characteristics discussed earlier . . . , it should be possible to select a likely disposal strategy (i.e., dispersive versus nondispersive).

For dredged materials containing low concentrations of toxic substances, the primary ecological [*impact*] may be burial and smothering of the benthic biota. To minimize the areal extent of such an impact, a nondispersive strategy might be employed. . . .

Past experience with the ocean disposal of dredged material [*may*] guide the disposal strategy chosen. Although final specification of the actual disposal strategy would probably not be made until the permitting stage, [*subsequent disposal-evaluation steps*] assume that a likely disposal strategy (dispersive versus nondispersive) can be postulated following dredged material characterization.

The text for Selection of Dredged Material Disposal Strategy: Dispersive versus Nondispersive was taken from EPA. 1990. Working Draft *Site Designation, Monitoring, and Management Guidance Document for Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Tetra Tech, Inc.

General Guidelines for the Selection of Candidate ODMDSs

The selection of candidate [*dredged-material*] disposal sites [*for more specific evaluation*] often is based on previous experience with ocean disposal evaluations and on a general

knowledge of the characteristics of the region. The following guidelines are recommended for use in selecting candidate sites for potential designation, based in large part on the general and specific criteria described in [*40 CFR 228*] of the regulations. . .

- At least two candidate sites should be selected so that a comparison can be made of relative impacts of dumping at each site. Wherever possible, at least one candidate site should be located beyond the edge of the continental shelf. Preference should also be given to sites that are presently in use or have been historically used [see § 228.5(e)].
- Candidate sites should be located in areas where disposal activities will not interfere with other activities in the marine environment, particularly areas of existing fisheries and shellfisheries, and regions of heavy commercial or recreational navigation [see § 228.5(a) and discussions of the identification of feasible areas for site designation . . .].
- If possible, candidate sites should be located in areas where sufficient field data have been collected to evaluate site characteristics. A summary of available survey results and station locations is particularly useful in selecting candidate sites.
- Candidate sites should be located such that temporary perturbations in water quality or other environmental conditions caused by disposal operations can be expected to return to normal ambient seawater levels or to undetectable contaminant concentrations or effects before reaching any beach, shoreline, marine sanctuary, or known geographically limited fishery or shellfishery [see § 228.5(b)].
- The size of the candidate site should be limited to localize and control any immediate adverse impacts and to allow for implementation of effective monitoring and surveillance programs to prevent adverse long-range impacts [see § 228.5(d)].
- The size of the candidate site should be sufficiently large to meet initial mixing requirements . . . and water-quality criteria at the disposal-site boundary.
- Proper management of the disposal site (including the regulation of times, rates, and methods of disposal, and the quantities and types of disposed materials) should be considered in selecting the location of the site and especially in defining the size of the site.
- Physical characteristics of the site should be appropriate for the dredged material disposal strategy selected. Where a nondispersive strategy is required, the bottom should be characterized as depositional, with slow current speeds and fine-grained sediments. Where a dispersive strategy is required, the water column should be hydrodynamically active [*and/or*] deep.

The text for General Guidelines for the Selection of Candidate ODMDSs was taken from EPA. 1990. Working Draft *Site Designation, Monitoring, and Management Guidance Document for Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Tetra Tech, Inc.

Characteristics of Candidate Sites

> Following selection of the candidate sites, existing site-specific information on ambient water quality, hydrography and physical transport, sediment geochemistry, and biological communities should be compiled to evaluate suitability of the sites for disposal of the dredged material under consideration. . . .

The physical, biological, and chemical characteristics of the dredged material should match as closely as possible the physical, biological, and chemical characteristics of the disposal site(s) sediments.

> . . . Ideally, for all aquatic environments, the following [*should be considered*]
>
> - Grain sizes of the dredged material should be relatively similar to the grain sizes of the sediment in the vicinity of the potential site. . .
>
> - Nature of the material should be such that long-term alterations in background turbidity are not a result of erosion of material from the site. . . .

Following are discussions of the physical, chemical, and biological characteristics of the dredged material as they relate to the proposed disposal site(s) and surrounding area (e.g, water). For example, Physical – Chemical refers to the physical characteristics of the dredged material and the chemical characteristics of concern at the disposal site.

Physical – Biological

> . . . In an aquatic [*disposal site*], (1) the grain size of the dredged material should be such that it is readily recolonized by organisms living in the surrounding area; (2) the physical characteristics of the dredged material should be such that it does not destroy unique habitat. . . . [*M*]aterial with characteristics different from those of the disposal-site environs or material that results in changes in bottom topography can provide an attractive habitat to aquatic organisms.
>
> In the case of wetland creation, the grain sizes of the dredged material should be satisfactory to the dominant species expected to colonize the wetland. If the material is suitable to the needs of the local biota, the proposed site can be expected to recolonize relatively rapidly by natural dispersion and propagation. If the physical characteristics of the sediment do not match the needs of the biota in the area, then recolonization will be slower and may require management.

Physical – Chemical

> . . . [*T*]here is relatively little interaction between the physical characteristics of the dredged material and the chemical characteristics of the receiving water in the vicinity of the proposed disposal site as long as suspended sediment from the site does not affect nearby coral reefs or submerged aquatic vegetation. . . .

[*Physical – Physical*]

[*Mounding of dredged material at the disposal site may induce alterations in current patterns, creation of eddies, creation of navigational hazards, or inhibit other uses of the site (e.g., fishing).*]

Biological – Physical

. . . [*D*]redged material with potential toxicity or bioaccumulation should be placed in sites such that adequate monitoring [*and management*] is possible. Dredged material in which toxicity or bioaccumulation is of potential concern should be placed at sites from which the material will not be broadcast. If toxicity or bioaccumulation is a potential concern, such material should not be (1) used in such a manner as to create a potentially attractive habitat [*for fish or other important species*] or (2) placed in sites from which erosion and increased turbidity are likely.

Nontoxic and nonbioaccumulative dredged materials should be used in wetland creation [*where*] there are no serious concerns in matching the biological characteristics of the material with the physical characteristics of the site. Dispersion of sediment or water influenced by [*noncontaminated*] sediment will not be of concern as long as the erosion does not damage the physical integrity of the site.

Biological – Biological

The dredged material placed at aquatic disposal sites should not show a potential for toxicity or bioaccumulation of contaminants in the organisms that live in the vicinity of the site or are likely to recolonize the material. The material [*that does have toxicity or bioaccumulation potential*] should be managed in such a way as to prevent those organisms from having direct access to it. . . . The material disposed in the vicinity of submerged aquatic vegetation should not be of such a nature that contaminants or suspended solids from the material could affect that vegetation.

Since only nontoxic and nonbioaccumulative dredged material should be used for wetland creation, the only concern is that the . . . dredged material [*is*] susceptible to recolonization by biota common to the area. Pests associated with the dredged material must not be introduced into [*a wetland-creation*] area. . . .

Biological – Chemical

. . . [*T*]he toxicity and bioaccumulation potential of the material should be no greater than the potential for such phenomena associated with the chemical contaminants already at the vicinity of the aquatic-disposal or wetland-creation site.

Chemical – Physical

. . . [*C*]ontaminated material should be placed in such a way that its dispersion is minimized. Contaminated material should be disposed in a manner that does not create an attractive habitat for aquatic organisms. Dredged material should not be disposed in a site from which resuspension will have a long-term influence on the background turbidity in the area.

Since only relatively uncontaminated material should be used for wetland creation, dispersion of material from the site is of no major concern as long as the erosion is not sufficient to threaten the physical integrity of the wetland.

Chemical – Biological

. . . [*C*]ontaminated material should be disposed in such a way that access to it by aquatic organisms is minimized either by the nature of the disposal operation or by management activities. Only noncontaminated material should be used to create an attractive habitat for aquatic organisms.

Since only relatively uncontaminated material should be used for wetland creation, there should be no contaminant impacts on organisms colonizing the newly created wetland.

Chemical – Chemical

. . . [*T*]he contaminants in the material should be comparable to or lower than the contaminants in the sediments in the vicinity of the aquatic-disposal or wetland-creation site. . . .

The matching of dredged material characteristics for aquatic disposal sites and for wetland creation are similar. However, the following additional factors should be considered for wetland creation. . . .

- Grain sizes of the dredged material and grain sizes of the sediments in the vicinity of the potential site [*should*] be relatively similar to enhance rapid biological recolonization
- Dredged material should be physically stable in the wave and current environment in which it is being placed
- The physical shape of the wetland to be created should be such that adverse changes in circulation and sedimentation patterns in the area will be minimal
- The nutrient content and other characteristics of the dredged material should be such that wetlands vegetation will become established.

Determination of the Potentially Acceptable Disposal Option(s)

. . . [*Determination*] of potentially acceptable disposal option(s) is based on a quantitative evaluation and comparison of the characteristics of the dredged material with characteristics of the disposal sites being considered. . . . In addition to evaluating the five general and 11 specific criteria, the options that provide the greatest number of acceptable matching conditions. . . become the potentially acceptable options.

This process is likely to identify several potentially acceptable options that may differ in detail but whose acceptability are approximately equal. In such cases, any of the options could probably be selected with equally satisfactory results. Many of these comparisons

may be qualitative even though many characteristics of the dredged material at the disposal site are measured quantitatively. . . .

The text for Characteristics of Aquatic and Wetland Candidate Sites and Determination of Potentially Acceptable Disposal Option(s) was taken from EPA. 1990. Working Draft *Site Designation, Monitoring, and Management Guidance Document for Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Tetra Tech, Inc.; and from EPA/USACE. 1990. Draft *Dredged Material Disposal Strategy Document.* In preparation by Battelle Ocean Sciences and EA Engineering, Science, and Technology, Inc.

3.3.5 Determination of Fate and Potential Effects for Each Candidate Site

[*Determining the appropriate size of a candidate site is essential for comparison of potential impacts. Analyses of mixing-zone models and deposition models will allow appropriate sizing.*] . . . The primary reason for conducting detailed analyses and modeling of initial dilution of the material is to demonstrate that the combination of dredged material characteristics, receiving water characteristics, and disposal strategy will ensure the sufficient dilution of the dredged material so that compliance with applicable regulatory criteria can be predicted. For instantaneous discharges, continuous discharges, and hopper dredge discharges of dredged material, an additional justification for modeling the mixing processes affecting the material is to predict the distribution of the settled material . . . on the seafloor. A very important consideration in the analyses of initial mixing and sedimentation is the cumulative effect of multiple dumps on the water column and sediments. . . .

The ecological effects of ocean dumping are difficult to assess because the underlying processes are very complex. . . . However, application of physical oceanographic models [*e.g., mixing*] for each of the candidate sites provides an estimate of the relative degree of impact that can be expected at each site, and permit ranking of the sites by the acceptability of their respective ecological impacts. Comparing predicted conditions at a candidate disposal site with known conditions at an existing disposal site will assist in predicting the magnitude and spatial extent of the expected ecological effects of ocean disposal of the dredged material under consideration. . . .

. . . For decision-making, the environmental fate and effects of dredged material disposal at each site will be evaluated based on the location of the dredged material plume following disposal (fate) and biological impacts (effects). Location of a dredged material plume following disposal can be defined as being nearfield (within disposal site boundaries) or farfield (outside site boundaries). Biological effects include both short-term (acute) and long-term (chronic) effects as well as effects on ecological processes. Both short-term and long-term effects can include mortality, accumulation of contaminants in tissues, and physiological or biochemical dysfunction. Long-term effects also encompass growth and reproduction. Ecological processes include population and community functions. . . .

The text for Determination of Fate and Potential Effects for Each Candidate Site was taken from EPA. 1990. Working Draft *Site Designation, Monitoring, and Management Guidance Document for Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Tetra Tech, Inc.

Fate of Dredged Material

In assessing both nearfield and farfield fate of waste material, four regulatory requirements should be assessed:

- Water-quality criteria must be met after initial mixing (nearfield).
- Water-quality criteria must be met at the disposal site boundary (nearfield).
- Concentrations of pollutants, both in the water column and in the bottom sediments, must be reduced to ambient levels before reaching critical areas (farfield).
- Dumped dredged material must not adversely impact the general ecosystem of the area, including communities in any nearby critical areas (nearfield and farfield). . . .

The text for Fate of Dredged Material was taken from EPA. 1990. Working Draft *Site Designation, Monitoring, and Management Guidance Document for Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Tetra Tech, Inc.

Biological-Effects Assessment

. . . It is usually not possible to use information on ambient biological conditions to make quantitative predictions of impacts that would result from specific waste disposal practices, due largely to a limited understanding of cause-and-effect relationships between waste materials and biological communities, and to the large amount of variability inherent in biological systems. . . . However, it is often possible to minimize or eliminate potential impacts by selecting sites with the use of available information on ambient biological conditions and the types of wastes likely to be dumped. . . .

. . . Potential biological and ecological effects of ocean dumping may be organized into seven major categories:

- Toxicity
- Degradation of water quality
- Degradation of sediment quality and alteration of sediment characteristics
- Contamination of the biota
- Creation of a disease epicenter
- Changes in community structure
- Disruption of ecological processes

These effects may result both within and beyond disposal site boundaries. . . .

The text for Biological-Effects Assessment was taken from EPA. 1990. Working Draft *Site Designation, Monitoring, and Management Guidance Document for Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Tetra Tech, Inc.

3.3.6 Evaluation of Candidate Sites

. . . The evaluation of alternate candidate sites comprises the following:

- Evaluation of relative impacts among the candidate ocean disposal sites
- Evaluation of ocean disposal in relation to other disposal alternatives

All comparisons among candidate and existing sites should include quantitative or qualitative evaluation of the perceived risks associated with alternative disposal options. No general framework for comparative risk analysis at candidate open-water disposal sites has been developed to date. However, a framework for disposal of dredged materials in Puget Sound (State of Washington) is available . . . and may serve as a model for such comparisons.

Ideally, site assessments would be based on objective criteria for assessing the acceptability and severity of impacts, as they are for water-quality assessments. However, there are no accepted quantitative criteria for sediments or biota. Some criteria are now being developed by scientists and regulators, but none has been approved for general use by any ocean resource management program or agency. Three examples of models that could possibly be used to develop criteria for sediments and biota are the [*(1)*] screening-level concentration model . . . , [*(2)*] apparent effects threshold model . . . , and [*(3)*] Equilibrium Partitioning Approach. . . .

. . . Several recently published documents provide guidance on the application of quantitative models to predict specific types of impacts (e.g., effects of toxic substances on marine biota, bioaccumulation, human health risks). However, [*no models have yet been developed that can comprehensively estimate impact at disposal sites*]. There are major gaps in the assessment methods, some of which are now being researched. Better assessment methods will undoubtedly be developed during the next decade. [*Biological*]-level responses to certain types of disturbance or contaminant have also been described in some cases. Examples are the empirically derived species, abundance, biomass model developed by Pearson and Rosenberg (1978) to describe changes in benthic community structure along a gradient of organic enrichment in the sediments, and patterns of infaunal succession that result from the disposal of dredged materials. . . . However, such community-response models are not quantitative, and cannot be used for mathematically rigorous predictions. . . .

Paul *et al.* (undated manuscript) propose . . . methods by which impacts to marine organisms and public health risks may be assessed. They use toxicological data in the scientific literature to develop water-quality criteria. These water-quality criteria are then compared with plots of time-averaged contaminant concentrations in the water (and possibly sediments) to determine possible impacts to the resident biota. This approach may be used in place of a direct biological-effects assessment. To assess the bioaccumulation potential of the disposed materials, body burdens of contaminants in exposed organisms are assumed to be in equilibrium with their surroundings, and it is assumed that the equilibrium level can be estimated by use of a bioconcentration factor. Estimated body burdens are then compared with the U.S. Food and Drug Administration (FDA) action levels for the contaminant under consideration to determine if there is a threat to public health. Although promising, this model assumes that the laboratory test organisms respond similarly to those at the selected disposal site. It also does not address multiple-contaminant effects. Moreover, it incorporates major assumptions regarding the transfer of contaminants from the biota to the water. Until such assumptions have been tested and proven reasonable, the accuracy of predictions derived from the use of this approach is unknown. . . .

In addition to applying the above models, it would be useful to review

- Bioaccumulation data
- Available literature on biomagnification

- Results from previous assessments of impacts of disposal

The text for Evaluation of Candidate Sites was taken from EPA. 1990. Working Draft *Site Designation, Monitoring, and Management Guidance Document for Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Tetra Tech, Inc.

3.3.7 Site Selection and Final Designation of an ODMDS

. . . [*Discussion in the preceding sections have presented the process for conducting*] decision-making . . . in the selection and designation of an ocean disposal site. [*The decision-making*] procedures have been organized in a series of analyses of increasing complexity that is consistent with the tiered approach of Zeller and Wastler (1986). Application of the technical guidance provided in this section will ensure that adequate consideration is given to each of the general criteria to be applied in the selection of appropriate ocean disposal sites, as well as to the 11 specific factors to be taken into account in the site-designation process [*40 CFR 228.6(a)(1-11)*].

It is important to reiterate that site designation is quite distinct from the issuance of permits for ocean dumping at a designated site. The evaluation of ocean dumping conducted as part of the site-designation process is more general than that conducted for the issuance of permits, and is intended only to identify suitable sites for consideration as ocean disposal sites. Designation of a site does not authorize the dumping of waste material at a site. Dumping at a designated site may take place only after a permit authorizing such dumping has been issued.

The text for Site Selection and Final Designation of an ODMDS was taken from EPA. 1990. Working Draft *Site Designation, Monitoring, and Management Guidance Document for Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Tetra Tech, Inc.

3.4 PREPARATION OF AN ENVIRONMENTAL IMPACT STATEMENT

In accordance with the EPA's voluntary national policy on the preparation of Environmental Impact Statements (EIS) (39 FR 37419), all site designations will be preceded by the preparation of an EIS. The EIS addresses the

- Purpose and need for the proposed ocean disposal
- Evaluation of alternatives
- Description of the physical, biological, and socioeconomic environments
- Prediction of the environmental consequences of the proposed action.
- Selection of the designated site as the preferred alternative
- The environmental consequences of the proposed dredged-material disposal at the designated site and at any other candidate sites considered, as well as those of any land-based disposal alternatives

A monitoring and management strategy should also be included in the EIS to describe site management.

After preparation of the EIS, a proposed rule announcing the EPA's intent to establish an ocean disposal site is published in the *Federal Register.* Based on comments received on the proposed rule and on the draft EISs, a final rule is then published in the *Federal Register* on the designation of the ocean disposal site.

PERMITTING

4.0 PERMITTING

The USACE is given authority to issue permits for ocean dumping of dredged material when the proposed dumping will not unreasonably endanger human health, amenities, or the marine environment [Section 103(a)]. The EPA has an oversight and review role in the permit-issuance process.

> If . . . dredged material is proposed for disposal into ocean waters, the [*USACE*] uses the procedures contained in 33 CFR Part 337. Where dredged material is placed in the Territorial Sea (3 nmi seaward from the baseline), [*for purposes such as*] beach replenishment, construction of underwater berms, or other related activities, the procedures of [*CWA*] Section 404 are used. . . .
>
> The text for Section 4.0 PERMITTING was taken from EPA. 1990. Draft *EPA Guidance Manual for the Review of COE Permits and Federal Projects for the Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Science Applications International Corporation.

4.1 CWA SECTION 404 PERMITS

The permit process under [*CWA Section*] 404 includes (1) processing the permit application and determining which type of permit may be issued, (2) issuing a public notice, (3) evaluating the project under CWA 404(b)(1) Guidelines, (4) a public interest review by the [*USACE*], (5) deciding if the permit should be issued or denied.

The CWA Section 404 permit program is administered jointly by [*USACE*] and EPA. Under CWA Section 404(a), the Secretary of the Army "may issue permits, after notice and opportunity for public hearings for the discharge of dredged or fill material into the navigable waters at specified disposal sites." The discharge of dredged material into navigable waters involves either direct dumping or "runoff or overflow from a contained land or water disposal area" [33 CFR Part 323.2(d)].

The EPA is responsible for (1) development of the program's environmental standards [CWA Section 404(b)(1) Guidelines], [*(2) review/veto of dredging permits, (3)*] determining the scope of geographic jurisdiction and the applicability of permit exemptions under CWA Section 404(f), [*(4)*] State program assumption, and [*(5)*] enforcement. The [*USACE*] is responsible for permit processing. The [*USACE*] issues permits for dredged material disposal.

EPA and other Federal agencies [such as, Fish and Wildlife Service (FWS), National Marine Fisheries Service (NMFS), and State and local agencies] have statutory authority and responsibility to provide recommendations concerning permit issuance.

Permits issued by the [*USACE*] under CWA Section 404 have to undergo a review for consistency with State coastal zone management programs. . . . In addition, permits require certifications (or waivers of same by the State) of compliance issued pursuant to the CWA Section 401. Under the CWA Section 401(a), any applicant for a Federal license or permit "to conduct any activity. . . which may result in any discharge into the

navigable waters" is required to obtain a certification from the State that any such discharge will comply with the CWA provisions related to effluent discharge limitations. The CWA Section 401 certification or waiver thereof and determination of consistency with CZMA programs has to be obtained before a permit can be issued. A certification is also required concerning compliance with applicable water-quality standards adopted pursuant to the CWA Section 303. If the State denies certification, the permitting authority may not grant a permit for the activity in question. The State-certification process under CWA Sections 303 and 401 are tools for State review of dredged material disposal activities.

The [*USACE*] evaluation of a CWA Section 404 permit application is a two-part process: (1) determining if the project complies with the CWA Section 404(b)(1) Guidelines and (2) conducting a public-interest review. The public-interest review is conducted simultaneously with the CWA 404(b)(1) Guidelines evaluation. In the public interest review, the [*USACE*] adopts a "balancing" approach in considering all factors that may be relevant to the project proposal. The public-interest review weighs benefits against reasonably foreseeable detriments. This review is supposed to address factors such as

> . . . conservation, economics, esthetics, general environmental concerns, wetlands, cultural values, fish and wildlife values, flood plain values, land use, navigation, shore erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, considerations of property ownership, and in general, the needs and welfare of the people.

A permit must be denied if the project fails to comply with the CWA Section 404(b)(1) Guidelines or is found to be contrary to the public interest. . . .

The text for Section 4.1 CWA SECTION 404 PERMITS was taken from EPA/USACE. 1990. Draft *Dredged Material Disposal Strategy Document.* In preparation by Battelle Ocean Sciences and EA Engineering, Science, and Technology, Inc.

4.2 MPRSA SECTION 103 PERMITS

. . . MPRSA § 103(e) provides that, in connection with Federal projects involving dredged material, the Secretary may, in lieu of the permit procedure, issue regulations that will require that such projects be evaluated in the same manner as non-Federal projects, using the same criteria, factors, and procedures [33 USC 1413(e)]. A formal permit is not necessary for Federal projects meeting these requirements.

. . . There are three types of general permit: programmatic, regional, and nationwide. Nationwide permits are issued for 5 years. The regulations do not stipulate permit length for other permit types. Consequently, all other permits continue in effect until their expiration dates, or until they are modified, suspended, or revoked. However, EPA and the [*USACE*] are currently holding further discussions to determine the appropriate duration for a permit. . . . Naturally, this is a general guideline and the need to reevaluate an activity depends on the dredged material and site-specific conditions. . . .

Programmatic permits are issued for activities that repeated regularly within an existing State, local, or Federal agency program. Regional permits are issued by the District or Division Engineer to allow similar activities to be conducted with a large geographic area, without the need for separate applications or other authorization documents. Conditions

may be added by the District or Division Engineer to Regional permits to require case-by-case reporting and an acknowledgment system, if he believes that the conditions serve the public interest.

Nationwide permits (NWP) are designed to allow certain activities to be conducted with little, if any, delay or paperwork. Nationwide permits are issued by the Chief of Engineers and only the Office of the Chief of Engineers has the authority to modify, suspend, or revoke a nationwide permit in accordance with the procedures at 33 CFR 325.7. This authority includes adding individual, regional, or nationwide conditions; revoking authorities for certain authorized activities or on a case-by-case basis. If a NWP is not modified or reissued within 5 years of publication in the *Federal Register,* the permit becomes null and void.

According to 33 CFR 330.2(c), Division Engineers have the discretionary authority to add regional conditions to NWPs, to override permit provisions of NWPs, and to require individual permit applications. Activities under a permit are valid only if the permit conditions have been met. If an activity is covered under a nationwide permit, the person conducting the activity is not required to complete an application (unless required by the Division Engineer). Instead, the person must comply with the conditions under which the permit is issued. In terms of ocean disposal, nationwide permits apply only to those activities with material volumes less than 10 cu yd produced as part of a single and complete project. Prenotification requirements are generally not required for discharges under Section 103 of the MPRSA. However, it is important to note that detailed procedures are required for discharges under Section 404 of the CWA at 33 CFR 330.7(a). . . .

. . . The determination to issue a permit is subject to [*EPA oversight and review to ensure that the proposed disposal will comply with the EPA criteria relating to the effects of the dumping.*]

The text for Section 4.2 MPRSA SECTION 103 PERMITS was taken from EPA. 1990. Working Draft *Site Designation, Monitoring, and Guidance Document for Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Tetra Tech, Inc.; EPA/USACE. 1990. Draft *Dredged Material Disposal Strategy Document.* In preparation by Battelle Ocean Sciences and EA Engineering, Science, and Technology, Inc.; and EPA. 1990. Draft *EPA Guidance Manual for the Review of COE Permits and Federal Projects for the Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Science Applications International Corporation.

4.2.1 Issuing Permits

. . . [*Section 103 of the MPRSA authorizes the*] Secretary of the Army, acting through the [*USACE*], to issue permits for the transportation of dredged material for the purpose of dumping it into open ocean and coastal waters (33 USC 1413). Dumping is permitted only after the Secretary determines that such disposal will not "unreasonably degrade or endanger human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities" [*MPRSA § 103(a), 33 USC 1413(a)*]. . . .

[*The typical steps for issuing permits are*]

1. [*Submission of request for permit application*]

   The [*USACE coordinates*] permit drafting and permit requests with the EPA prior to public review. This avoids potential EPA nonconcurrence of the permit.

2. [*Filing of Permit Application*]

   An application is filed with the appropriate [*USACE*] district

3. [*Determining Permit Type*]

   The [*USACE*] determines if an individual permit is required

4. [*Review of Permit Application*]

   The [*USACE*] determines [*if*] the application is complete

5. [*Preparing and Publishing a Public Notice*]

   Public notices[, *which are*] in the form of an announcement on [*USACE*] letterhead, . . . are distributed to all parties on the [*USACE*] mailing list. . . .

6. [*Soliciting Comments (within a specific comment period)*]

   . . . [*EPA*] Regional Administrators have the authority to review the permit [*-issuance decisions*] . . . for ocean dumping of dredged material at locations within the respective Regional jurisdictions. . . . Regional jurisdiction to act on permitting issues is determined . . . in accordance with § 228.4(e) of the Ocean Dumping Regulations and Criteria.

   The [*USACE*] review of dredged material disposal-permit applications [*must*] consider and apply the environmental-impact criteria developed by EPA [*under*] MPRSA Section 102(a). [*The statute directs that in developing the criteria EPA is to consider the following statutory factors:*]

   - Need for the proposed dumping
   - Effects of such dumping on human health and welfare, including economic, esthetic, and recreational values
   - Effects of such dumping on fisheries resources, plankton, fish, shellfish, wildlife, shorelines, and beaches
   - Effects of such dumping on marine ecosystems, particularly with respect to
   - The transfer, concentration, and dispersion of such material and its byproducts through biological, physical, and chemical processes
   - Potential changes in marine-ecosystem diversity, productivity, and stability
   - Species and community population dynamics
   - Persistence and permanence of the effects of the dumping
   - Effects of dumping particular volumes and concentrations of such materials

- Appropriate locations and methods of disposal or recycling, including land-based alternatives and how requiring the use of such alternative locations or methods could impact the public interest

- Effects on alternative uses of oceans, such as scientific study, fishing, and other living-resource exploitation, and nonliving resource exploitation

- In designating recommended dumping sites, utilization of locations beyond the edge of the continental shelf, wherever possible, by the EPA Administrator. . . .

In designating recommended sites, the Administrator shall utilize, wherever feasible, locations beyond the edge of the continental shelf. . . . To protect critical areas [MPRSA Section 102(c)], the EPA Administrator may, . . . in consultation with the [*USACE*], designate sites or times within which certain materials may not be dumped.

Under MPRSA § 103(b), the Secretary of the Army is also required to make an independent determination of the need for the proposed dumping, alternative methods of disposal, and appropriate sites for disposal [33 USC 1413(b)]. This involves consideration of alternative aquatic (e.g., near-coastal waters, estuaries, rivers, lakes, and wetlands) and land-based disposal methods (e.g., upland).

7. [*Reviewing Comments*]

. . . When the public comment period is closed and all relevant data have been gathered, the [*USACE*] conducts a "public interest review" in which the [*USACE*] considers the favorable as well as detrimental impacts of the activity. The [*USACE considers*] all comments, suggestions, and concerns provided by the EPA and other commentors and incorporate their comments into the administrative record of the application. . . .

8. [*Granting or Denying the Permit*]

Upon completion of the EPA review of the public notice, the EPA Regional Administrator in accordance with 40 CFR 225.2(b) advises the District Engineer in writing of his finding of whether the proposed activity complies with [*EPA's*] environmental criteria. If the proposed dumping does not comply with EPA criteria, the District Engineer [*must determine*] if there is an economically feasible alternative or disposal site. . . .

. . . If the Secretary of the Army finds that "there is no economically feasible method or site available," other than that which would [*result in*] a violation of [*EPA's*] environmental impact criteria, the Secretary may request a waiver from the EPA Administrator. The EPA Administrator [*is to*] grant the waiver within 30 days unless he finds that, pursuant to MPRSA § 103(d), the dumping of the material will result in [*unacceptable adverse effects]* on municipal water supplies, shellfish beds, wildlife, fisheries, or recreational areas [33 USC 1413(d)]. Thus, the final determination of [*whether*] ocean disposal of dredged material [*is allowable*] remains with the EPA Administrator. If the projects [*were to receive a waiver*], the [*USACE*] [*then would*] issue an ocean-dumping permit. [*In the history of the ocean-dumping program, no waivers have been requested.*]

The text for Issuing Permits was taken from EPA. 1990. Working Draft *Site Designation, Monitoring, and Guidance Document for Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Tetra Tech, Inc.; EPA/USACE. 1990. Draft *Dredged Material Disposal Strategy Document.* In preparation by Battelle Ocean Sciences and EA Engineering, Science, and Technology, Inc.; and EPA. 1990. Draft *EPA Guidance Manual for the Review of COE Permits and Federal Projects for the Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Science Applications International Corporation.

4.2.2 Evaluation of Other Disposal Options

Other disposal options must be evaluated during step 6 of the above steps for issuing permits. As discussed above, other disposal options that should be considered are estuaries, rivers, lakes, creation of nearshore islands, and upland disposal. The legal constraints, environmental impacts, and economic considerations of each disposal option must be considered in the decision-making process.

> [*Decision-making guidelines are being developed to identify the disposal option that will be environmentally acceptable for a given dredged material.*] The guidelines are not intended for distinguishing among specific sites. Rather they are aids for determining the relative ranking of an aquatic environment over an upland environment for the disposal of a given dredged material. They will also aid in differentiating among subsets of upland or aquatic sites (i.e., estuarine versus deep-ocean disposal). For purposes of this discussion, wetland creation is considered a subset of aquatic disposal inasmuch as the major physicochemical characteristics controlling contaminant mobility are similar in wetland and aquatic sites . . . .
>
> The process of identifying an acceptable disposal option involves first, determining (1) the characteristics of the dredged material, (2) potential disposal sites, and (3) the characteristics of the potential sites. The characteristics of the dredged material are then matched to the characteristics of the available disposal sites, to identify a possibly acceptable disposal option. The process is illustrated in Figure [*4-1*].
>
> The identified option is not necessarily the one that is correct for a particular disposal operation because a number of other factors may influence the final choice. There may also be a number of acceptable disposal options having little difference in the overall environmental impact. Selecting the correct option is a qualitative process that depends heavily on judgment and evaluation rather than on strict adherence to numerical calculations.
>
> The guidelines take into account the potential environmental impacts of disposing a given dredged material in potential sites. If testing . . . indicates that the dredged material is unacceptable for disposal at a site without management actions, the full range of guidelines must be followed. They will help to not only determine the appropriate management actions that must be imposed for a particular option but also evaluate those actions in relation to selecting other options. On the other hand, if biological testing indicates that the dredged material is acceptable for disposal at a site, then the only considerations that remain are the physical characteristics of the dredged material and the ecological implications of physical, technical-feasibility, and socioeconomic factors affecting the proposed site.

The text for Evaluation of Other Disposal Options was taken from EPA. 1990. Working Draft *Site Designation, Monitoring, and Management Guidance Document for Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Tetra Tech, Inc.; and from EPA/USACE. 1990. Draft *Dredged Material Disposal Strategy Document.* In preparation by Battelle Ocean Sciences and EA Engineering, Science, and Technology, Inc.

4.3 EPA COORDINATION OPPORTUNITIES

. . . [*T*]here are several opportunities throughout the [*USACE's dredge-permit*] planning process when EPA may communicate [*its*] concerns, recommend further analysis, or suggest plan modifications.

Points in the planning process for interacting with the [*USACE*] about Federal projects include

- Public Notice
- Statement of Findings
- Record of Decision
- Environmental Assessment
- Finding of No Significant Impact
- Environmental Impact Statements (Draft, Final, and Supplemental)

If the [*USACE*] staff brings up environmental concerns in the planning process, the [*USACE*] may wish to invite EPA to take part in Issue Resolution Conferences, conferences that normally include [*USACE*] staff members reviewing the project and, on occasion, the local sponsor. If EPA finds that the ocean-disposal activity does not meet the environmental criteria, EPA has three more opportunities to coordinate with [*USACE*], including

- EPA Review of the District Engineer's finding
- Coordination with the EPA Administrator and the Chief of Engineers
- Review of the waiver.

The [*USACE*] prepares many documents during in the planning process, some of which contain information necessary for EPA's evaluation of the proposed project. Depending on the project, EPA Regions may wish to review these documents as well as the supporting data. The following are the major documents prepared by the [*USACE*].

- Draft Reconnaissance Reports
- Reconnaissance Reports
- Engineering and Design Reports, such as Reevaluation Reports (or Detailed Project Report, in the case of projects funded under Continuing Authorities), General Design Memoranda
- Feasibility Cost-Sharing Agreements
- Scope of Studies
- Local Cost-Sharing Agreements

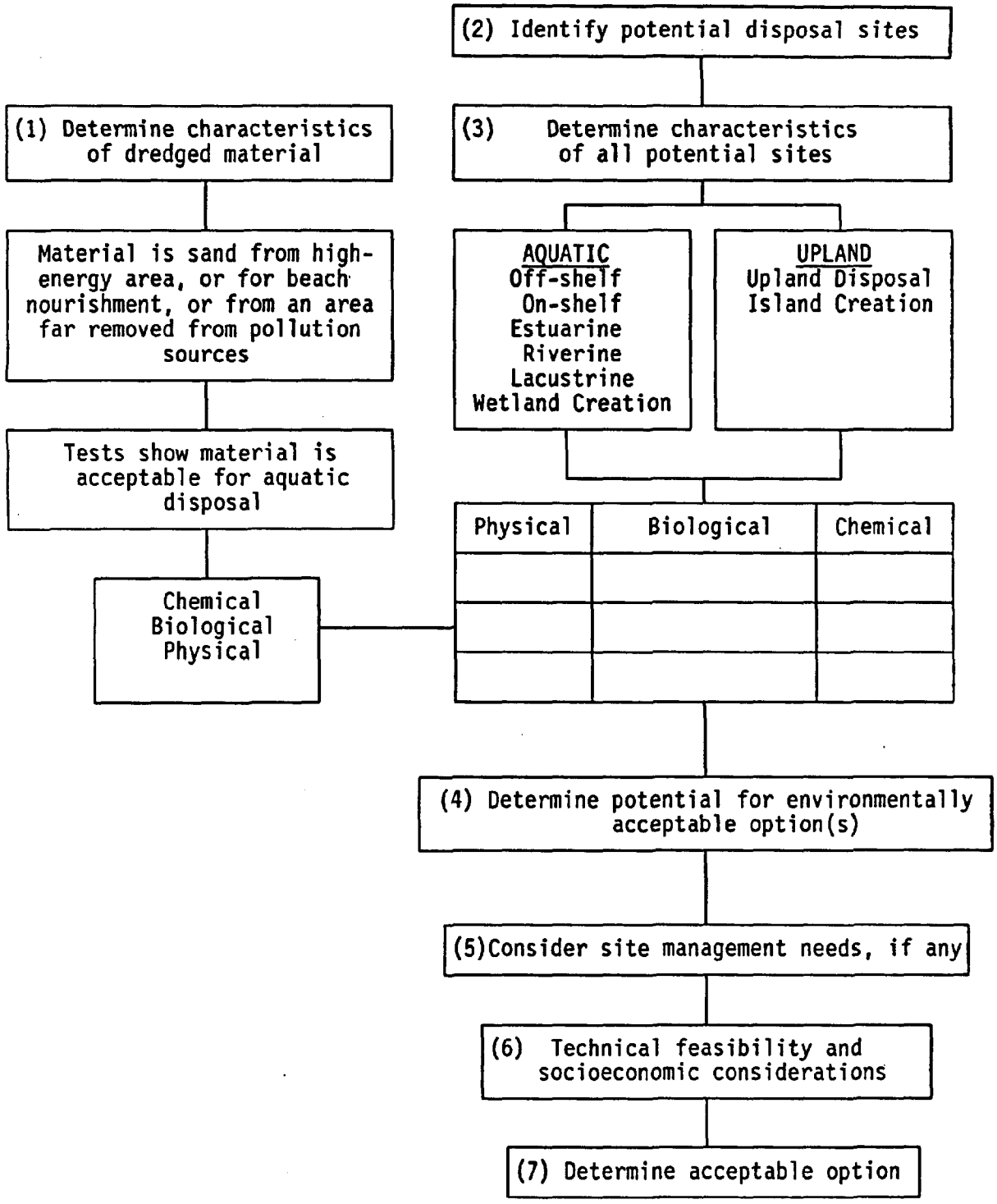


Figure 4-1. Summary of Decision Strategy for Identification of Environmentally Acceptable Dredged-Material Disposal Option. [From EPA/USACE. 1990. Draft *Dredged Material Disposal Strategy Document.* In preparation by Battelle Ocean Sciences and EA Engineering, Science, and Technology, Inc.]

- Draft Feasibility Report
- Final Feasibility Report
- Post-Authorization Report . . . .

EPA/USACE Communication Mechanisms

> [*EPA*] Regions that have the greatest success in coordinating with the [*USACE*] get involved as early as possible in the planning process for permits and Federal projects. . . . Many routes of [*informal*] communication are used . . . to decrease the need for paperwork and to minimize processing time. Written communication [*is generally*] reserved for documenting agreements, differences, and the need for future EPA reviews. . . .

EPA/USACE communication for dredging permit evaluation can include

- Regularly scheduled meetings (monthly/bimonthly/quarterly) with USACE District staff to discuss future plans and progress
- Periodic progress reports (once or twice a year) from the USACE Districts
- Telephone discussions with USACE District staff
- EPA/USACE conferences and Region/District meetings
- Joint EPA/USACE efforts/studies.
- Budget and data-needs coordination

The text for EPA Coordination Opportunities was taken from EPA. 1990. Draft *EPA Guidance Manual for the Review of COE Permits and Federal Projects for the Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Science Applications International Corporation.

DREDGED-MATERIAL TESTING

5.0 DREDGED-MATERIAL TESTING

The EPA role in evaluating dredged material for open-ocean disposal is incorporated in the draft EPA/USACE dredged-material testing manual, *Draft Ecological Evaluation of Proposed Discharge of Dredged Material into Ocean Waters* (EPA/USACE 1990. In preparation by Battelle Ocean Sciences and EA Engineering, Science, and Technology, Inc.). This document, commonly referred to as the "Green Book," is an update of the 1977 testing manual, *Ecological Evaluation of Proposed Discharge of Dredged Material into Ocean Waters* (EPA/USACE 1977. Published by the Environmental Effects Laboratory, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi). The 1990 Green Book is a publicly distributed draft revision of the 1977 manual. In early 1991, EPA and the USACE will publish and promulgate a final testing manual, *Evaluation of Dredged Material for Ocean Disposal – Interim Testing Manual,* to replace the 1977 manual. This revised Green Book will not carry the force of law. However, it will be the official EPA and USACE guidance for evaluating dredged-material compliance with the ocean dumping regulations (40 CFR 222-228).

The contents of the 1990 draft Green Book were summarized in the following paper that was presented by the EPA at the 17th Annual Aquatic Toxicity Workshop in Vancouver, British Columbia, Canada, November 5-7, 1990. Additional information on the EPA role in dredged-material testing and research programs can be obtained by contacting EPA Headquarters, Regional offices, and ORD laboratories.

EVALUATION PROCEDURES FOR DREDGED MATERIAL DISPOSAL IN OCEAN WATERS OF THE UNITED STATES

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ABSTRACT

The *Ecological Evaluation of Proposed Discharge of Dredged Material into Ocean Waters*, commonly referred to as the "Green Book," contains technical guidance on determining the suitability of dredged material for ocean disposal in U.S. waters. The United States Environmental Protection Agency and the United States Army Corps of Engineers published the original manual in 1977. The revised guidance manual, presently in draft form, is being updated to reflect dredging-program experience and to incorporate the improvements in evaluative testing.

Integral to the revised guidance manual is a tiered testing protocol that incorporates "pass/fail" decision points. The procedure comprises four levels (tiers) of increasing investigative intensity that generate information to assist in making ocean disposal decisions. Tiers I and II utilize existing or easily acquired information and tests that are relatively inexpensive, and apply rapid procedures to determine environmental effects. Tiers III and IV contain biological evaluations that are more intensive and require field sampling, laboratory testing, and rigorous data analysis.

INTRODUCTION

The *Ecological Evaluation of Proposed Discharge of Dredged Material into Ocean Waters*, commonly referred to as the "Green Book," contains technical guidance for determining the suitability of dredged material for ocean disposal through chemical, physical, and biological evaluations. This guidance is used by dredging applicants, laboratory scientists, and regulators to evaluate dredged-material compliance with U.S. Ocean Dumping Regulations, Title 40 Code of Federal Regulations Parts 220-228 (40 CFR 220-228). The basis of 40 CFR 220-228 is the Marine Protection, Research, and Sanctuaries Act of 1972, which requires that ocean disposal of dredged material not cause adverse impact to the marine environment.

The United States Environmental Protection Agency (EPA) and the United States Army Corps of Engineers (CE) published the original Green Book in 1977. Since then many advancements have been made in the evaluation methods of dredged material and in understanding the impact of ocean disposal. Also since 1977, region-specific criteria and policies have evolved for dredged-material disposal in U.S. waters, resulting in a wide range of sediment-testing procedures along the Atlantic, Pacific, and Gulf of Mexico coasts. For these reasons, the guidance in the Green Book is now being updated to reflect dredging-program experience, to incorporate improved evaluative testing, and to achieve an environmentally sound level of national regulatory consistency.

In January 1990, EPA and the CE published a draft of the revised 1977 Green Book and distributed it to Federal, State, and local regulatory personnel, port authorities, and other

individuals and companies involved in dredged-material evaluation. In the subsequent months, EPA and the CE have conducted training sessions on the new guidance and solicited public and Agency comments on the new manual. The manual is now undergoing minor revisions to address the comments received by EPA and the CE. Finalization and promulgation of the manual is expected in early 1991. Until this date, the guidance of the 1977 manual is still in force.

Concurrent with the work on the Green Book, EPA is revising the Ocean Dumping Regulations to improve their clarity, reflect dredging-program experience, and to incorporate various statutory changes. The 1990 Green Book will be modified as needed to correlate with the revised regulations.

This paper introduces the technical components of the 1990 Green Book. Integral to the manual is a tiered-testing protocol to characterize dredged material and predict its impact on the water column and the benthos at ocean disposal sites. This protocol was developed out of consensus among EPA and CE personnel and testing-laboratory researchers, and it balances the requirements of the Ocean Dumping Regulations, state-of-the-art dredged-material evaluation techniques, and the realities of the testing and permitting process for new and existing projects. Local expertise is both recommended and necessary to adapt the National guidance in the manual to specific dredged-material projects. Three EPA Regions and CE Districts have begun to apply the National guidance of the 1990 manual through the development of regional guidance manuals. In summary, the Green Book

- Provides for national consistency in evaluating dredged material for ocean disposal
- Ensures adherence to the Ocean Dumping Regulations
- Incorporates existing (and valuable) regional expertise and guidance in the evaluation process

Tiered Testing

The tiered-testing protocol in the Green Book comprises four procedural tiers, with decision points at each tier (Figure 1) to assist in decision-making for dredged-material disposal. Each successive tier provides increasing investigative intensity to generate the information for permitting decisions on ocean disposal.

- Tier I primarily assesses existing information on the proposed dredged material and identifies the contaminants of concern.
- Tier II uses calculations and numerical models to screen the chemical and physical characteristics of the dredged material and the overall conditions at the disposal site.

- Tier III consists of standardized acute bioassays and bioaccumulation tests on laboratory organisms.

- Tier IV tests specific projects for the results of long-term organism exposure to the dredged material that may influence reproduction and species survival.

The methods and evaluative strategies in each of the tiers are recommended to achieve National technical consistency and increased intersite comparability of data sets and analyses. The principal purpose of the tiered-testing protocol is to determine if the limiting permissible concentration (LPC)* is met as defined in Section 227.13(c) of the Ocean Dumping Regulations.

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*LPC of the water column is defined in the Green Book as the concentration of dredged material that, after allowance for initial mixing, does not exceed applicable marine water-quality criteria or a toxicity threshold of 0.01 of the acutely toxic concentration. The LPC of the suspended particulate and solid phases is defined as that which will not cause unreasonable toxicity or bioaccumulation.

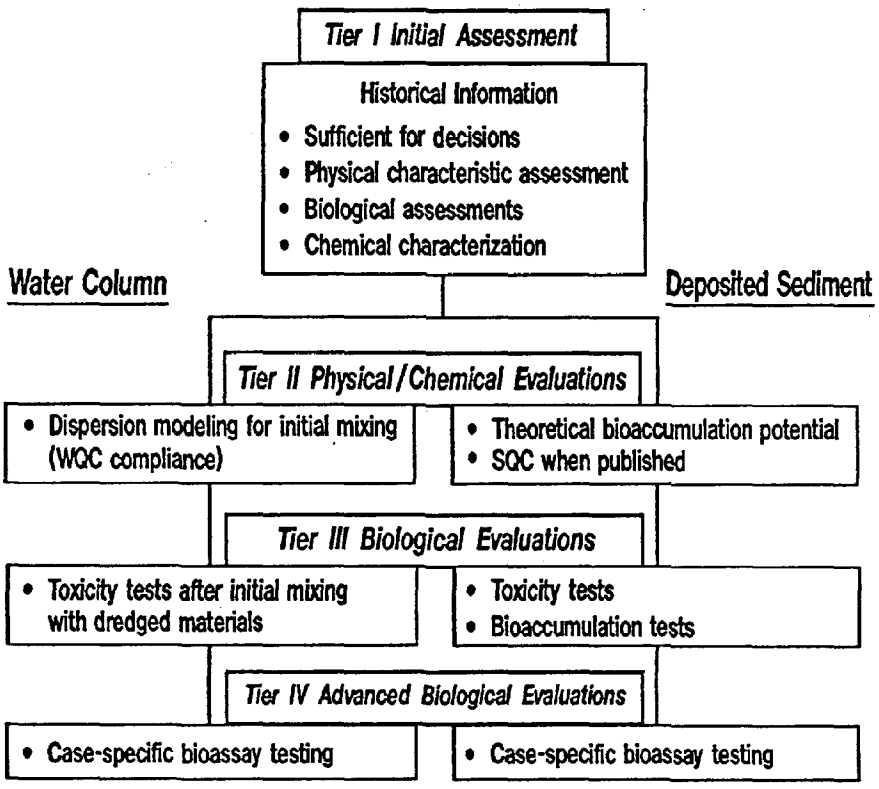

Figure 1. Overview of Tiered-Testing Protocol for Evaluating Dredged Material

"Green-light," "yellow-light," or "red-light" LPC evaluations are reached as the dredged-material evaluator proceeds through the tiers.

- Green Light
  The LPC is met and the ocean disposal option is supported.

- Yellow Light
  The LPC evaluation is inconclusive; proceed to the next tier

- Red Light
  The LPC is not met and the ocean disposal option is not supported.

The green-light for *both* water-column and benthic LPC evaluations must be reached for consideration of the ocean disposal option to proceed. A yellow-light evaluation in Tiers I-III requires the dredging applicant to conduct additional testing in subsequent tiers or to decide to not ocean-dump. However, a red-light evaluation does not necessarily exclude all possibilities for ocean dumping. For instance, if appropriate management actions can make the dredged material meet the LPC, ocean dumping could be allowed. Management-action procedures such as disposal-site capping, reducing the rate of disposal, treating the dredged material to immobilize or transform contaminants, or other alternatives, could be considered. Management actions for red-light evaluations are *not* included in the Green Book because of the wide range of available options and the project-specific nature of such work.

The tiered-testing protocol is relatively flexible. As presently written, the dredged-material evaluator can enter and exit the dredged-material testing procedures at any tier. However, to begin the evaluation in Tier II, III, or IV, the existing data must satisfy the requirements of the earlier tier(s). To exit a tier before reaching a green light requires the dredging applicant to select non open-ocean disposal.

Dredged material that cannot be definitively evaluated under Tiers I, II, and III must be evaluated under Tier IV. In such cases, the applicant might choose to not spend additional time and resources on Tier IV testing and instead select a non open-ocean disposal alternative. Similarly, an applicant can try to save time and money by proceeding directly to Tier II, III, or IV if it is believed that analysis in the earlier tiers will not lead to a definitive evaluation. The applicant can also choose to continue testing under later tiers to support an evaluation reached in an earlier tier. The only absolute requirement is that the dredged material must comply with the regulations if it is to be dumped in the ocean. The tiered-testing protocol facilitates this determination.

Tier I: Initial Assessments

The purpose of Tier I (Figure 2) is to identify contaminants of concern and determine dredged-material compliance through analysis of existing chemical, physical, and biological information. For a green light to be reached in this tier, the information must be sufficient to conclude that the material is in full compliance with the LPC. For many dredging operations, there is a wealth of readily available information on the proposed dredged material and on the characteristics of the disposal site. This is especially true of areas that have historically

undergone maintenance dredging or have been the subject of other studies, such as fish-stock assessments. The available information for a given area might not be sufficient to reach a final LPC evaluation, but often there are accessible high-quality data that can supplement the results of tests in subsequent tiers and facilitate reaching an early decision with lowered expenditure of resources. Table 1 lists the possible sources of information that can be used to partially or fully evaluate proposed dredging operations. The list is not intended to be comprehensive. Other sources may be considered for additional information. Whatever the source of information for Tier I, the quality of the data must be evaluated and weighed accordingly. The references in Chapter 13 of the manual, Quality Assurance (QA) Considerations, can be consulted for guidance for evaluating the quality of data obtained from different information sources.

If the information is sufficient to determine water-column and deposited-sediment effects in Tier I, either a red light or green light is reached: (1) The LPC is not met and the ocean-disposal option is not supported. (2) The LPC is met and the ocean-disposal option is supported (if all other requirements of the regulations are satisfied). An evaluation at this tier usually requires expert analysis of the information on the characteristics of both the proposed dredged material and of the environment of the disposal site. If the information is not sufficient to reach a decision within this tier (yellow light), the evaluative process moves into Tier II.

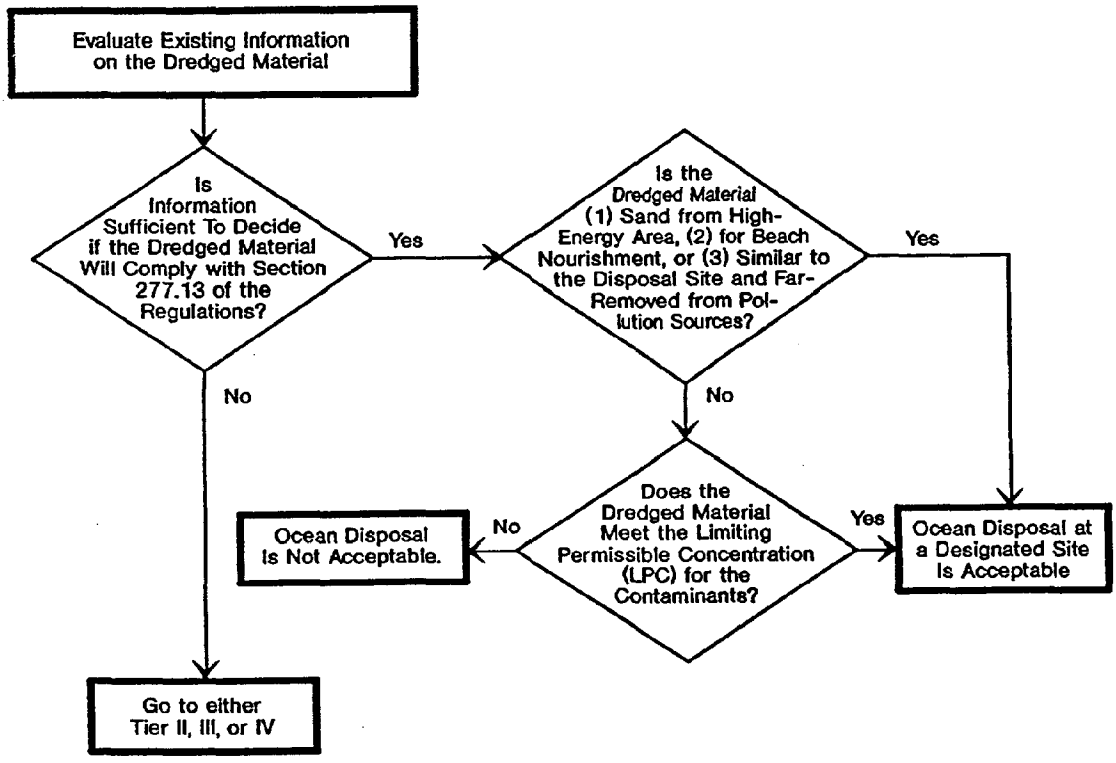

Figure 2. Tier I: Evaluation of Existing Information

Table 1: 1990 Green Book Information Sources for Tier I Dredged-Material Evaluation

- Study reports on prior chemical, physical, or biological tests on the material proposed to be dumped or on similar materials
- Study reports on prior environmental monitoring on the material proposed to be dumped or on similar materials
- Local public and private records on potential contaminants of concern entering the proposed dredged-material sediments
- Selected Chemical Spill Listing records (EPA)
- Pesticide Spill Reporting System records (EPA)
- Pollution Incident Reporting System records (United States Coast Guard)
- Identification of in-place pollutants and priorities for removal (EPA)
- Hazardous-wastes sites and management facilities reports (EPA)
- CE studies of sediment pollution and sediments
- STORET, BIOS, CETIS, and ODES databases (EPA)
- Water and sediment data on major tributaries [U.S. (Geological Survey)]
- National Pollutant Discharge Elimination System (NPDES) permit records
- Section 404(b)(1) evaluations
- Pertinent and applicable research reports
- Section 103 evaluations
- Port Authorities' records
- College and university published/unpublished information
- Records of State environmental agencies
- Published scientific literature

Tier II: Physical/Chemical Evaluations

Under Tier II, water-column and benthic evaluations are made separately. The purpose of this tier is to provide reliable, rapid, environmentally conservative screening for potential impact. This is possible to achieve for water-column evaluations by using a numerical mixing model. At present, there are no approved methods to comprehensively evaluate deposited sediment at this tier. Only nonpolar organic compounds in sediment can be evaluated under Tier II at this time. When sediment-quality criteria (SQC) are promulgated, they will be incorporated into Tier II.

Tier II: Water-Column Physical/Chemical Evaluations

Tier II water-column evaluations use information acquired in Tier I (Figure 3). If water-quality criteria (WQC) are unavailable for all of the contaminants of concern in the proposed dredged material or synergistic effects among the contaminants are suspect, testing must be performed in Tier III. (Synergism is usually suspected if more than one contaminant is present.) However, if WQC are available for the contaminants and no synergism is suspected, a red-light/green-light water-column evaluation can be reached at this tier through the application of a numerical mixing model.

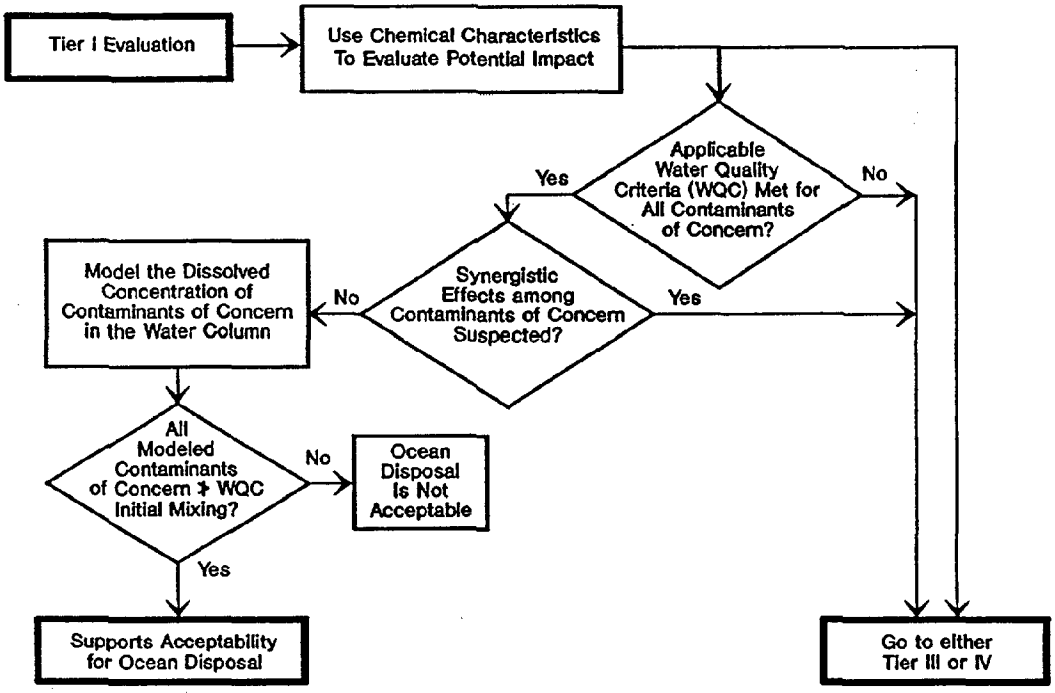

Figure 3. Tier II: Water-Column Physical/Chemical Evaluations

Numerical Models for Initial Mixing

The numerical models in the Green Book evaluate dredged-material dilution during the initial-mixing phase of ocean disposal. Section 227.29 of the regulations defines initial mixing as 4 hours following a dredged-material dump. During this 4-hour period, the concentration of the contaminants in the water column is allowed to exceed the LPC *within the boundary of the disposal site.* However, if water currents transport the settling dredged material out of the disposal site before 4 hours expires, the point in time when the material crosses the site boundary is used in determining compliance. Exceeding the LPC outside the site *at any time* is a violation of the regulations.

The Automated Dredging and Disposal Alternatives Management System (ADDAMS) models, developed by the CE, are the recommended models for evaluating initial mixing of dredged material at ocean disposal sites. ADDAMS models can be run on a personal computer with a minimum of hardware. The models account for the physical processes of dredged-material disposal at open-water disposal sites by calculating water-column concentrations of dissolved contaminants and suspended sediments and the initial deposition of material on the bottom. Three separate ADDAMS models address different methods of disposal:

- DIFID Disposal from an instantaneous dump
- DIFCD Disposal from a continuous discharge
- DIFHD Disposal from a hopper dredge

To evaluate initial mixing following ocean disposal, the appropriate model is run *for the contaminant requiring the greatest amount of dilution* to meet the LPC. The models simulate movement of the disposed material as it falls through the water column, as it is transported and diffused by the ambient current, and as it spreads over the bottom. The models have some limitations, e.g., the DIFID model will not work for very shallow disposal sites where the discharge time from the barge exceeds the descent period to the bottom. However, the models can simulate a wide range of disposal options. EPA and the CE are in the process of field-verifying these models. When the models are fully verified and approved, they will be able to support definitive water-column evaluations and, thereby, reduce additional time and expense of running Tiers III and IV evaluations.

The models treat the descending dredged material as a dense liquid. This assumes that all of the constituents in the material are released into the water column and that the LPC can be evaluated in a conservative manner. At a typical disposal site, unless it is extremely deep (>300 m), the dredged material usually settles, with its contaminants, to the bottom in clumps.

The Green Book contains an appendix on the ADDAMS models and an early 1990 version of the programs on computer diskettes. Since distribution of the 1990 manual, the models have been revised to be more user friendly and CE modelling personnel are available at the CE Waterways Experiment Station (WES), Vicksburg, Mississippi, to supply the latest versions of the models, answer questions, and assist with running the appropriate models. In general, model input parameters include

- Disposal-site descriptions
- Disposal-operation descriptions
- Disposal-site water-current velocity descriptions
- Dredged-material descriptions
- Coefficients for the movement of the dredged material through the water column
- Input, output, and execution descriptions.

Model output includes

- Repetition of the input data for QA considerations
- History of the descent and collapse phases of the discharge in both numeric and diagrammatic displays.

In DIFID and DIFHD, the following time-dependent information can be requested.

- Size of the collapsing cloud of dredged material in the water column
- Cloud density
- Centroid location and velocity
- Contaminant and solids concentration

The model output can present water-column contaminant concentrations in milligrams per liter. These concentrations are compared to the appropriate LPCs to determine compliance at the boundary of the disposal site or compliance within the site following the 4-hour initial-mixing period.

Tier II: Benthic Physical/Chemical Evaluations

As discussed above, presently only benthic effects attributed to nonpolar organic chemicals in the deposited sediment can be addressed in Tier II (Figure 4). Nonpolar organic chemicals include all organic compounds that do not dissociate or form ions. This includes chlorinated hydrocarbon pesticides, other halogenated hydrocarbons, polychlorinated biphenyls, most polynuclear aromatic hydrocarbons, dioxins, and furan. It does not include polar organic compounds, organometals, and metals. If all of the contaminants of concern in the dredged material are *nonpolar* organic compounds, the theoretical bioaccumulation potential (TBP) can be calculated for the dredged material and a reference sediment* to determine LPC bioaccumulation compliance at this tier. The TBP calculation is based on concentration of the nonpolar organic chemicals in the sediment, the total organic carbon concentration, and the percent lipid content of an organism of interest. If the TBP of the dredged material is not statistically greater than that of the reference material, then a green light is reached for bioaccumulation evaluation under Tier II. (Acute-toxicity evaluations must be performed under Tier III unless sufficient toxicity information had been obtained under Tier I.)

*A reference sediment is defined as a sediment, substantially free of contaminants, that has grain-size characteristics as similar as practicable to the dredged material and to the sediment at the disposal site, and that reflects conditions at the disposal site as though dredged-material disposal had taken place.

If any of the contaminants of concern are polar organic compounds or have suspected toxic components or the dredged-material TBP exceeds the reference material TBP described above, the evaluation for benthic impact by the dredged material must take place in Tier III or IV. At present, only a green-light or a yellow-light outcome for bioaccumulation evaluation is possible under Tier II. The need for additional tests in Tier II to screen for benthic impact is recognized by EPA and the CE, and new tests are under development and evaluation. When the scientific and regulatory community verifies one or more of these tests, they will be incorporated into Tier II in a future Green Book revision. In the meanwhile, evaluation of benthic impact that cannot be made in Tier I must be completed in Tier III or IV.

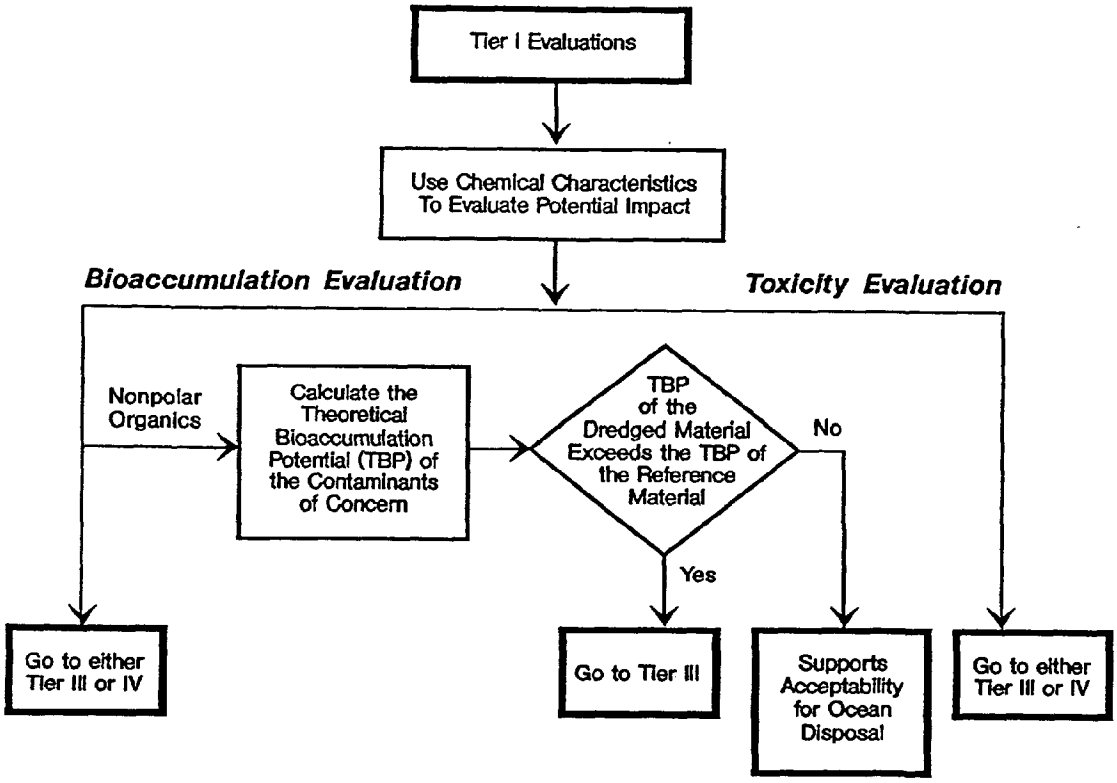

Figure 4. Tier II: Benthic Physical/Chemical Evaluations

Tier III: Biological Evaluations

Tier III testing includes (1) determination of water-column toxicity according to the regulatorily defined suspended phase and (2) an assessment of contaminant toxicity and bioaccumulation from the material to be dredged. The evaluations in this tier are based on the output from Tiers I and II and comprise standardized bioassays with the organisms listed in Table 2.

Tier III: Water-Column Biological Evaluations

Tier III water-column tests are acute tests that evaluate the toxicity of the dissolved and suspended portions of the dredged material that remains in the water column after initial mixing (i.e., 4 hours postdisposal) (Figure 5). The bioassays are run if the Tier II evaluations are inconclusive, i.e, there are not applicable WQC for all contaminants of concern or there is reason to suspect synergistic effects among the contaminants. (See Tier II.) Tier III involves exposing fish, crustaceans, and zooplankton to a dilution series containing both dissolved- and suspended-sediment components of the dredged material. A typical test monitors organism mortality over a 96-hour period.

The results of the bioassays are used to calculate the LC_{50} concentration of the dredged material in the water column. The LPC for this evaluation is 1% of the LC_{50}. Following the determination of the LPC, a red-light or green-light evaluation is reached with the application of the numerical model (discussed above).

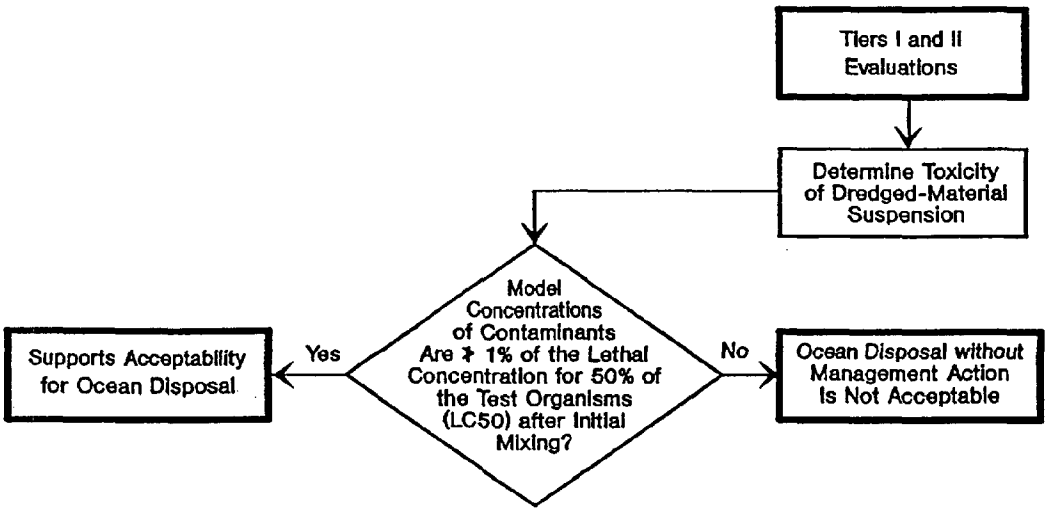

Figure 5. Tier III: Water-Column Biological Evaluations

Table 2. Species for Water-Column and Benthic Evaluations in the 1990 Green Book

Water Column Species	Benthic Species
• Crustaceans	• Crustaceans
Mysids	Infaunal Amphipods
Mysidopsis sp.[a]	*Rhepoxynius* sp.[a]
Neomysis sp.[a]	*Ampelisca* sp.[a]
Holmesimysis sp.[a]	*Eohaustorius* sp.[a]
Shrimp	Mysids
Palaemonetes sp.	*Mysidopsis* sp.
Penaeus sp.	*Neomysis* sp.
Pandalus sp.	*Holmesimysis* sp.
Crab	Shrimp
Callinectes sapidus	*Penaeus* sp.
Cancer sp.	*Palaemonetes* sp.
• Fish	*Crangon* sp.
Menidia sp.[a]	*Pandalus* sp.
Cymatogaster aggregata[a]	Crab
Lagodon rhomboides	*Callinectes sapidus*
Leiostomus xanthurus	*Cancer* sp.
• Zooplankton	• Burrowing Polychaetes
Copepods	*Neanthes* sp.[a]
Acartia sp.[a]	*Nereis* sp.[a]
Mussel larvae	*Nephthys* sp.
Mytilus edulis[a]	*Glycera* sp.
Oyster larvae	*Arenicola* sp.
Crassostrea virginica[a]	*Abarenicola* sp.
Ostrea sp.[a]	• Molluscs
Crustacean larvae	*Yoldia limatula*
Recommended species[a]	*Macoma* sp.

[a]Recommended test species

Tier III: Benthic Biological Evaluations

Benthic evaluations in Tier III consist of toxicity and bioaccumulation tests with the organisms that are listed in the righthand column of Table 2 (Figure 6). To conduct these test, the Green Book provides laboratory guidance on sediment preparation, reference- and control-sediment tests, treatment replicates, organism handling, test-chamber conditions, QA/QC considerations, and data analysis. The organisms used in the tests are surrogates for disposal species and are used to estimate dredged-material effects. The toxicity tests quantify lethality. If the mortality in the dredged-material bioassays is greater than 10%* over the mortality in the reference-sediment bioassays, the LPC are not met (red light). If, however, acute toxicity in the dredged-material tests is less than 10% above that in the reference-sediment tests, the LPC is met (green light).

*Some approved tests allow for a larger percentage.

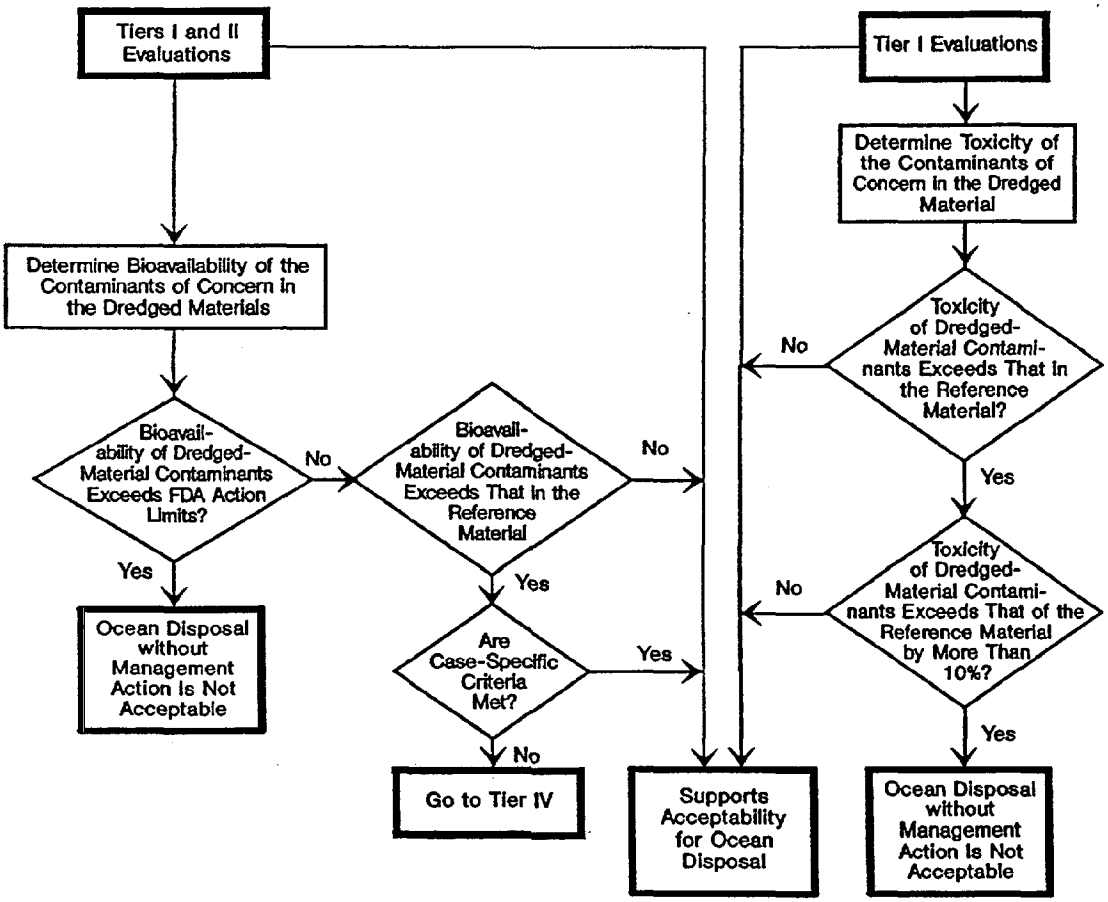

Figure 6. Tier III: Benthic Biological Evaluations

The bioaccumulation tests (usually run concurrently with the toxicity tests) evaluate the potential of benthic organisms to accumulate contaminants from the dredged material in their tissues. At the conclusion of the tests, the tissue of the organisms are analyzed for the contaminants of concern that were identified in Tier I. Extrapolation of the bioaccumulation-test results is used to assess potential transfer of contaminants into the marine food web.

Section 227.27 of the regulations requires that benthic bioassays be conducted on dredged material with filter-feeding, deposit-feeding, and burrowing species. Infaunal amphipods, such as *Ampelisca* sp. and *Rhepoxynius* sp., are strongly recommended in the Green Book as the preferred species for toxicity tests. They are sensitive bioindicators of impact as they both filter and deposit feed and they build burrowing tubes in benthic sediments. For bioaccumulation evaluations, the Green Book recommends using a burrowing polychaete (e.g., *Neanthes* sp. or *Nereis* sp.) and a deposit-feeding bivalve mollusc (e.g., *Macoma* sp. or *Yoldia limatula*). In summary, the manual recommends that two species be tested for acute toxicity and two additional species for bioaccumulation evaluation. Each set of test species should cover the three species types stipulated in the regulations. The ecological and economic relevance of the organisms and the practical aspects of using the species in the laboratory, such as tolerance to grain-size ranges and year-round availability, also must be considered when selecting the test species.

The Tier III bioaccumulation evaluation compares the contaminant level in the tissues of the organisms to two criteria: (1) the United States Food and Drug Administration (FDA) Action Levels for Poisonous or Deleterious Substances in Fish and Shellfish for Human Consumption and (2) the contaminant levels in the reference-material organisms. Regardless of the statistical comparison to the reference-material test organisms, if the level in the tissues of dredged-material organisms exceeds the FDA levels in any category, the LPC is not met. If the dredged-material results are lower than the FDA action levels and not statistically greater than the reference material, the LPC is satisfied and the ocean-disposal option is supported. However, if bioaccumulation of some contaminants in some species exceeds that found in the reference-material tests, the test results must be evaluated against case-specific criteria. EPA and the CE develop the evaluative criteria case by case from local technical information that addresses the bioaccumulation aspects of the benthic criteria of Section 227.13(c)(3) of the regulations. The purpose of this case-specific bioaccumulation evaluation in Tier III is to reach an environmentally sound red-light or green-light evaluation without having to commit significant time and resources under Tier IV testing.

At present, tests for chronic sublethal exposure to benthic contaminants are being developed. When the tests are approved by EPA, they will be incorporated in Tier III in future revisions to the Green Book.

Tier IV: Advanced Biological Evaluations

Tier IV consists of bioassay and bioaccumulation tests to evaluate the long-term benthic and water-column impact of dredged material (Figures 7 and 8). Tests at this level are selected to

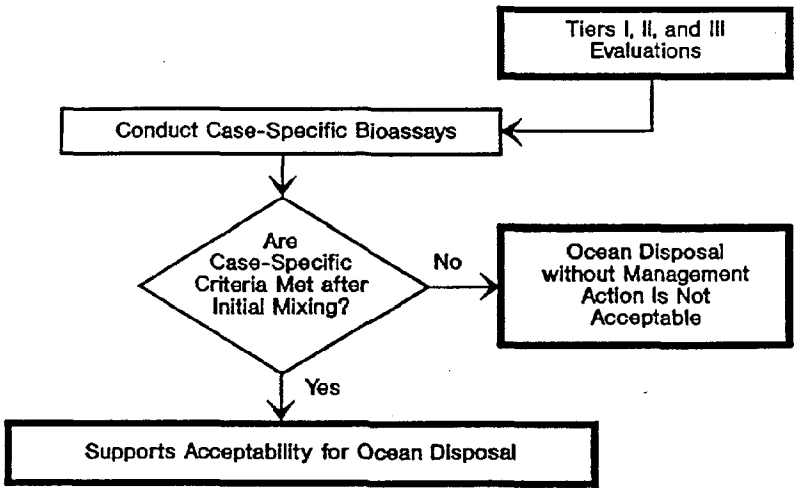

Figure 7. Tier IV: Advanced Water-Column Biological Evaluations

address specific issues for a specific dredging operation that could not be fully evaluated in the earlier tiers. Since these tests are case-specific and since they require significant time and money to complete, evaluative criteria must be agreed on in advance by EPA and by the CE to determine compliance with the regulations.

Tier IV bioassays help to interpret the bioaccumulation results from Tier III and to measure indicators of long-term effects of clear ecological importance, such as survival and reproduction. The bioaccumulation testing measures the steady-state body burden of contaminants of concern in the tissues of organisms that have been subjected to long-term laboratory exposures or in tissues of appropriately sampled field organisms. The actual contaminant concentrations in the tissues of dredged-material organisms is then compared to the FDA Action Limits and to those of the reference-material organisms, as in Tier III. If the concentrations in the dredged-material organisms are less than the FDA limits but are greater than in the reference-material organisms, they are compared to field-collected organisms from the area of the proposed disposal site. Bioaccumulation levels that exceed those of the disposal-site organisms – but still do not exceed the FDA action levels – are then assessed against case-specific criteria for a final decision on LPC compliance.

In practice, Tier IV testing will seldom be conducted for water-column evaluations because the potential for high water-column or benthic impact will probably become apparent early in the evaluation process and show that the LPC cannot be met. Tier IV benthic testing is more likely, but the Green Book emphasizes that this tier is not intended for routine application. Tier IV benthic tests consume significant resources of the dredging applicant and of the regulatory authority, and a noncompliance evaluation is still possible. The applicant must weigh the options and decide whether to perform Tier IV testing or to consider an alternative such as upland disposal. If the applicant elects to proceed with Tier IV testing, the role of the regulatory authority is to design tests that lead to a definitive LPC evaluation for the project.

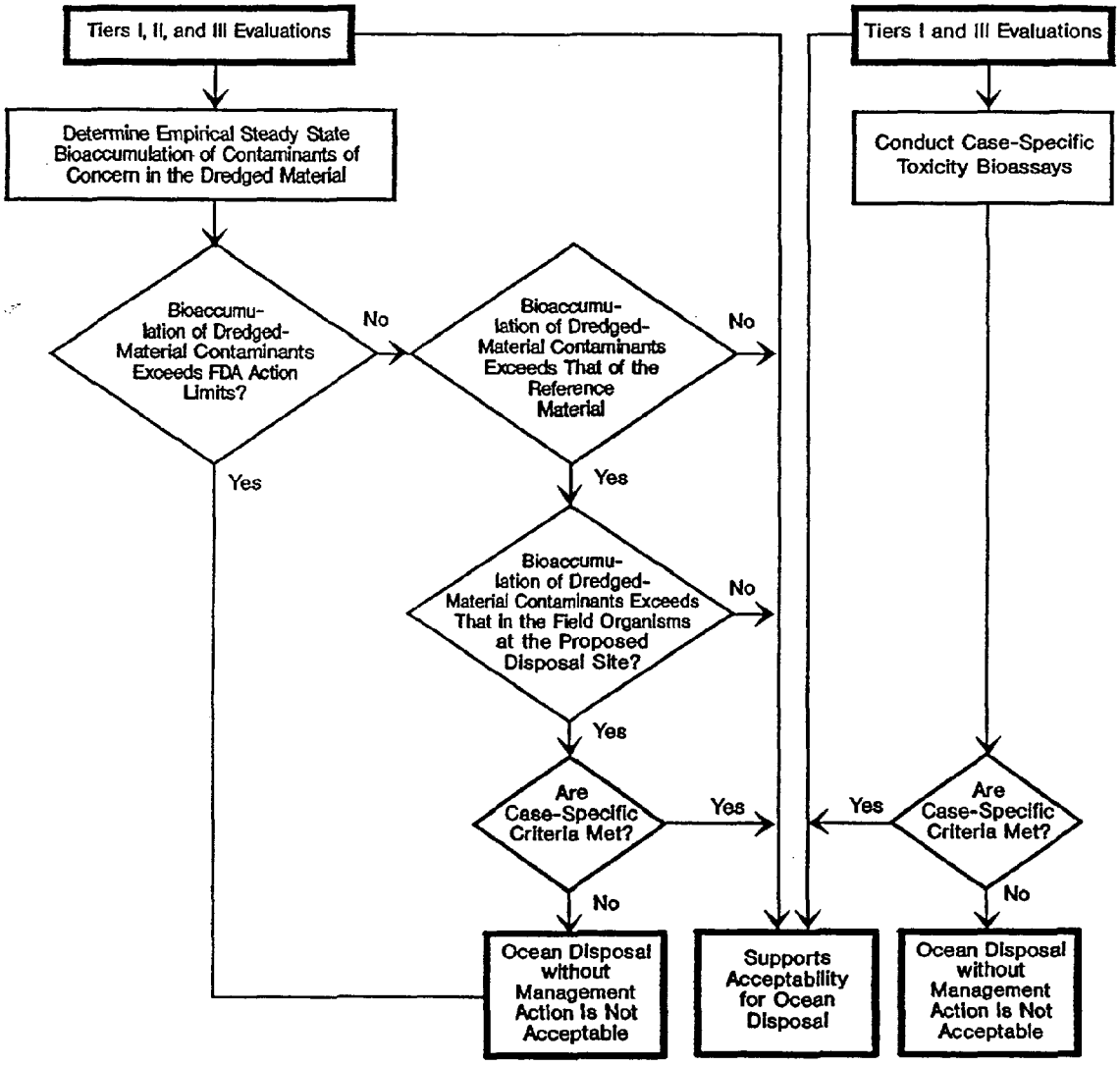

Figure 8. Tier IV: Advanced Benthic Biological Evaluations

OTHER INFORMATION IN THE MANUAL

In addition to the detailed guidance provided on testing and decision-making within the tiers, the manual also includes sections on sample collection, analytical methods, statistical methods, QA, and a copy of the Ocean Dumping Regulations. The statistics section details the appropriate methods for analyzing bioassay and bioaccumulation data, including sample-size

determinations, data-scale transformations, variance homogeneity tests, two-way *t* tests, analysis of variance (ANOVA), multiple comparisons among treatment means, and confidence interval calculations. The QA section details the importance of QA as a management tool for government regulators and testing laboratories to ensure that the data produced are of known and documented quality.

SUMMARY

The 1990 Green Book is a national guide for dredging applicants, scientists, and regulators to follow in determining if a particular dredged material meets the LPC in the regulations. It is neither a "cookbook" or a comprehensive document. Additional assessments, such as on the economic necessity, related impacts, and analysis of other disposal options, are required before a final permitting decision is reached on ocean disposal. The guidance in the manual must be applied with a thorough understanding of the ocean-dumping regulations and with assistance from the many references cited in the text. The tiered-testing protocol is intended to assist in ecologically sound and efficient decision-making for ocean disposal of dredged material. As new methods and technologies are developed to test dredged material, they will be incorporated into subsequent revisions of the manual.

As the Federal authorities finalize the Green Book, EPA Regions and CE Districts will continue to develop regional companion manuals. These regional manuals will supplement the national guidance in the Green Book and assist applicants and evaluators with permit application and the logistics of project-specific dredged-material evaluation. When the Ocean Dumping Regulations are revised, the guidance in the Green Book will be updated accordingly.

REFERENCES

Environmental Protection Agency/United States Army Corps of Engineers Technical Committee on Criteria for Dredged and Filled Material. 1977. *Ecological Evaluation of Proposed Discharge of Dredged Material into Ocean Waters; Implementation Manual for Section 103 of Public Law 92-532 (Marine Protection, Research, and Sanctuaries Act of 1971).* July 1977 (second printing April 1978). Environmental Effects Laboratory, United States Army Engineer Waterways Experiment Station, Vicksburg, MS.

Environmental Protection Agency/United States Army Corps of Engineers. 1990. *Ecological Evaluation of Proposed Discharge of Dredged Material into Ocean Waters.* January 1990. United States Environmental Protection Agency, Office of Marine and Estuarine Protection, Washington, DC 20460. EPA-503-8-90/002.

MONITORING AND MANAGEMENT

6.0 MONITORING AND MANAGEMENT

6.1 MONITORING

In general, tiered monitoring programs proceed through a series of testable null hypotheses that predict the transport, fate, and impact of disposed material on the environment. Experimental methods are chosen to test the null hypotheses. If the null hypothesis is accepted (i.e., if the null hypothesis is true), the predictability of the ocean-dumping impact is established and data collection can be minimized. To ensure an effective monitoring program, the following are necessary.

- Specific questions
- Statistically valid studies
- Baseline data
- Currently available data

An effective monitoring program is developed by proceeding through the following steps [*Figure 6-1*]. . . .

1. Development of a conceptual framework for the program
2. Statement of objectives of the program
3. Development of null hypotheses
4. Grouping the null hypotheses into tiers
5. Selecting parameters and the associated methods to collect data on those parameters
6. Describing the variability of those parameters within the natural system
7. Generating a monitoring program design that will allow detection of changes in parameter values of significance to site managers

If these steps are followed, data generated by the monitoring program will be complete, defensible, and useful for making management decisions.

6.1.1 Conceptual Framework of the Monitoring Program

Developing a conceptual framework for monitoring means that existing information about the characteristics of the dumpsite and of the dredged material is used to make a first approximation of the potential for effects from dredged material disposal.

The actual monitoring that may be necessary for a site is determined case by case. The nature and extent of monitoring necessarily depends on the circumstances. Basically, the characteristics of the dumpsite and of the dredged material to be disposed are used to develop a framework for monitoring. The particular factors to be considered in developing specific monitoring programs are the

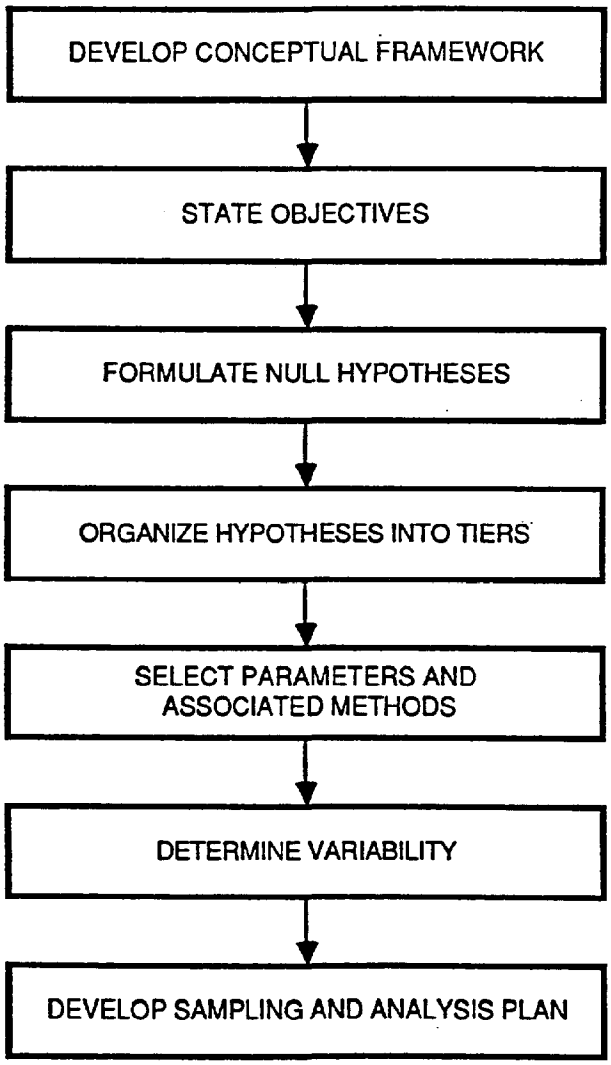

Figure 6-1. A Stepwise Approach to Developing Monitoring Programs Ensures That the Data Will Be Complete, Defensible, and Useful for Making Decisions. [From EPA/USACE. 1990. Draft *Site Designation, Monitoring, and Management Guidance Document for Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Tetra Tech, Inc.]

1. Quantity of dredged material to be dumped and its physical and chemical characteristics
2. Methods for releasing the material at the disposal site
3. Time, frequency, and duration of dumping operations
4. Relevant site characteristics, including, without limitation, the
   - Nature of marine biota and oceanographic conditions at or near the site
   - Existing uses of the site for purposes other than dredged material disposal
   - Proximity of the site to areas containing significant marine resources or amenities
5. Existing information on the disposal site, or previous dumping operations
6. Practicability of specific monitoring techniques.

6.1.2 Objectives of Monitoring

All dumpsite monitoring programs are designed ultimately to ensure that dumping of waste materials in the ocean does not adversely affect human health or the marine environment. This intent can be separated into two categories: to provide relevant information needed (1) to evaluate compliance with permit conditions and (2) to determine the impacts of dumping. The specific ends that may be addressed by monitoring programs are

- Verification of permit terms and conditions
- Verification of physical or chemical properties of the dredged material to be dumped
- Assessment of mixing, transport, or dispersion of the dredged material to be dumped
- Assessment of the effects of the dumping on human health or the marine environment, resources or amenities
- Assessment of whether the adverse impacts described in Part 228 § 228.10(c)(1) are occurring.

All of these issues lie in one of the two categories discussed above. Amplifying the description of categories (1) and (2) above, we can state that the objective of dumpsite monitoring is to ensure that Federal regulations are met by assessing whether

- Ocean dumping permit conditions and dumpsite management requirements are met
- Dumping adversely impacts human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities. . . .

Monitoring activities . . . are designed to verify not only that permit conditions are met during dumping activities, but also to verify the assumption that the conditions set by the permit are sufficient to ensure that there will be no impact [*on the environment*]. . . .

6.1.3 Development of Null Hypotheses

Monitoring programs can be designed most effectively if they borrow the concept of null hypothesis testing from scientific experimentation. Implicit in the concept of an experiment is a question or null hypothesis that is being evaluated. A monitoring program focused on answering specific questions or testing null hypotheses concerning compliance with permit conditions and potential impacts of disposal of waste materials at sea will be designed quite differently from one that is viewed as simple data collection. . . .

The kinds of null hypotheses to be developed can be grouped into six categories. Null hypotheses concerning dredged material characterization, disposal operations, and some nearfield fate issues [e.g., compliance with limiting permissible concentrations (LPC)] address permit compliance and are used in determining which null hypotheses should be tested in assessing potential impacts. Null hypotheses concerning nearfield and farfield fate and transport and short- and long-term effects address impact assessment. . . .

6.1.4 Tiered Approach to Monitoring

After null hypotheses have been developed, the most effective strategy for assessing the impact of [*dredged*] material disposal is to use a tiered monitoring approach. . . . Such an approach will generate only the information that is needed for decision-making. Explicit monitoring objectives, endpoints, and null hypotheses are organized within a hierarchy of tiers. The stated objectives in each tier focus on the regulatory or environmental protection endpoints against which measured effects can be compared. Thus, each tier has a set of null hypotheses stated in terms of regulatory or environmental protection endpoints that may be tested in the field. It is important to recognize that null hypotheses are merely testable statements about endpoints; the endpoints themselves are the substance.

An idealized representation of a tiered monitoring program is shown in Figure [*6-2*]. It organizes the categories of hypotheses into a structure of tiers. Activities involved in dredged material characterization and disposal comprise the first tier. Second-tier monitoring activities test null hypotheses that deal with short-term transport, fate, and biological effects of ocean dumping. The third tier tests null hypotheses that deal with the long-term fate and effects of dumped materials. If long-term effects are detected, additional tiers may be required.

These tiers would assess any impact on fisheries or other resources of commercial or intrinsic value. It is important to note that both the number of tiers and the relationships between tiers will be program-specific, depending on the site and dredged material characteristics. For the purposes of this document, the organization of the tiers can be thought of as in Figure [*6-2*], with the tiers at the top of the figure referred to as upper tiers and those at the bottom of the figure referred to as lower tiers. The conceptual basis for a tiered approach to the monitoring program is that data collected in each tier are needed as the basis for the monitoring activities in the next tier.

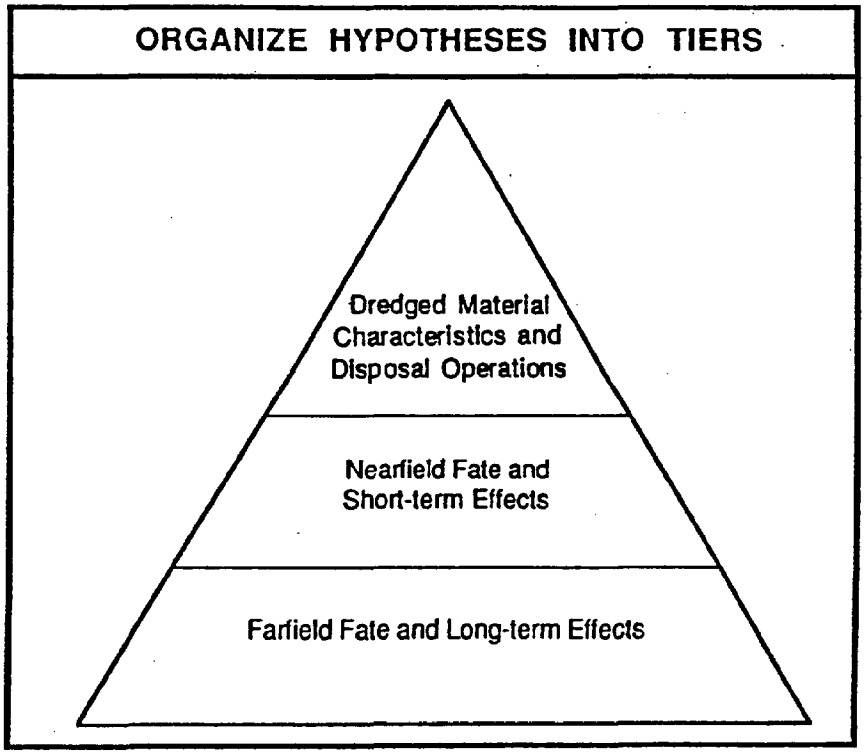

Figure 6-2. The Most Effective Strategy for Assessing Dredged-Material Characteristics Is To Use a Tiered Approach. [From EPA/USACE 1990. Draft *Site Designation, Monitoring, and Management Guidance Document for Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Tetra Tech, Inc.]

. . . Thus, data collected in the upper tiers on the chemical composition and properties of the dredged material and disposal operations are necessary to choosing the appropriate chemical parameters for measurement in the nearfield. Data from middle tiers on the composition, movement, and toxicity of materials in the nearfield are required to choose the best locations in the farfield to make measurements and the most appropriate parameters to measure in lower tier monitoring activities.

Another important attribute of the tiered approach to monitoring is that the outcome of the monitoring activities in each tier may provide a technically sound basis for deciding whether specific types of monitoring activities are needed in the next tier. For example, if monitoring activities in an upper tier show that concentrations of metals in the dredged material disposal plume(s) are diluted to background concentrations within the boundaries of the disposal site, then the decision may be made to not look for those chemicals in the farfield outside the site boundaries in lower monitoring tiers.

The basic design of the tiered approach dictates that the environmental and program-related questions to be answered by the monitoring program become more complex as the program moves from upper to lower tiers. . . . The lowest monitoring tiers focus on long-term effects of ocean dumping on commercially or recreationally important marine fishery resources; on marine reptiles, birds, and mammals; on sensitive marine habitats and recreational beaches; or on other marine resources of social or economic value. Because complex, lower-tier activities depend on upper tier results, upper tier studies may justify a decision to not conduct the lower- tier studies. In other words, a tiered monitoring strategy assumes that acceptance of the null hypotheses in upper tiers will provide protection from the impacts cited in the regulations (40 CFR § 228.10). In fact, for many sites, the absence of farfield/long-term impacts will be reliably predicted by nearfield/short-term activities, and thus limited or no farfield/long-term activities will be required.

Once a null hypothesis has been demonstrated to be true within an acceptable range of uncertainty, related field studies may be reduced to a level that is sufficient to verify that the null hypothesis is not violated under varied dredged material characteristics and disposal conditions. Null hypotheses can also serve as decision points for moving from upper to lower tiers. Ideally, detailed studies in a lower tier will be conducted only when data show that an upper-tiered null hypothesis is false, or if the results are uncertain.

Hypotheses must be framed by considering the statistical and logistical constraints on monitoring ocean dumping. Statistical considerations are necessary to ensure that the monitoring activities yield results that are meaningful and appropriate for hypothesis testing. Logistical considerations ensure that the monitoring design can actually be implemented. . . .

6.1.5 Selection of Parameters

Parameters chosen for monitoring should represent a direct linkage between the management concern and the hypothesis. Parameters are chosen that usually have the following characteristics:

- Meaningful socially, economically, and environmentally
- Sensitive to the impact
- Relatively invariant in the unimpacted, control situation
- Cost-effective to monitor. . . .

. . . Effective monitoring programs measure parameters that provide the most accurate and precise estimate of a mean value for the smallest sampling effort. That strategy will maximize information return per sampling effort. Selection criteria for parameters include parameters that

- Are not currently present in the environment (presence/absence tests may be easier to perform statistically than quantitative evaluation)
- Have inherently low variability

  This will provide more stable, tighter confidence limits on means, more powerful, and accurate tests of hypotheses
- Are easily measured and expected to show maximum effects of dumping

  This might be especially true for hypotheses about biological effects, for which the focus should be on organisms known or expected to bioaccumulate certain kinds of chemicals.

A sampling program must also distinguish between natural variability in selected parameters and actual effects of the dumping activities being monitored. Parameters may be chosen for measurement not as detectors of the effects associated with dredged material disposal, but as indicators of the oceanographic conditions that might influence natural variability. These parameters may include temperature, salinity, and density. . . .

6.1.6 Determination of Sources of Variability

Monitoring the impacts of ocean dredged material disposal operations on living marine resources of the ocean is made particularly difficult by the large fluctuations in these parameters on many spatial and temporal scales. . . . Variability is defined here as any deviation among measurements that cannot be directly associated with the effects of the dredged material disposal. As a result of this variability, monitoring programs must be designed to minimize this signal-to-noise problem. The variability must be described and quantified. Baseline information should be used to achieve cost-effective sampling and valid experimental designs. . . .

6.1.7 Development of Optimal Sampling and Analysis Plans

The goal of plan optimization is to develop the most powerful hypothesis tests possible. The power of the hypothesis tests depends to a great extent on the number of times paired comparisons can be made between reference and surveillance locations. Therefore, it is important to plan monitoring activities to (1) maximize the number of paired comparisons that can be completed in a given time and (2) allocate samples to minimize the error term in order to increase the power of hypothesis tests with a given number of paired comparisons.

Optimization is achieved by balancing statistical [*e.g., parametric or nonparametric statistical models*], logistical e.g., weather and time necessary to deploy sampling equipment, cost, and management e.g., will the chosen parameters yield useful information? . . . The steps in the process of optimizing plan design are . . .

- Determine Number of Stations and Replicates at Specified Budget
- Determine Number of Stations and Replicates at Specified Survey Length
- Modify Budget or Survey Length
- Determine Minimum Detectable Change for Specified Sample Numbers
- Compare Minimum Detectable Change to Management Need
- Repeat Process Until All Considerations are Optimized . . . .

6.1.8 Examples of Monitoring Categories and Null Hypotheses

- Dredged Material Characteristics and Disposal Operations
  The quantity and physical/chemical characteristics of the dredged material are within the permit limits.
- Nearfield Fate
  The dredged material plume(s) will follow a trajectory similar (40-200 percent of predicted concentrations) to that predicted by the model used to determine the waste load allocation for the specific site.
- Short-term Effects
  There will be no change in planktonic community structure associated with oxygen depletion of the water column attributable to ocean dumping.
- Farfield Fate
  The dredged material concentrations in waters and sediments at specific locations inside and outside the site are 40-200 percent of the concentrations predicted by the model used to determine the waste load allocation for the specific site.
- Long-term Effects
  Species of commercially, recreationally, or intrinsically valuable marine animals from within and adjacent to the site boundary do not accumulate in their tissues any contaminants derived from ocean dumped dredged materials to concentrations significantly higher than normal background concentrations. . . .

6.1.9 Quality Assurance

Formal quality assurance (QA) programs are required by the EPA policy (Administrator's memoranda, 30 May 1979, 14 June 1979; EPA Order 5360.1, "Policy and Program Requirements to Implement the Quality Assurance Program," 3 April 1984). The goal of the EPA QA Program is to ensure that all measurements supported by the EPA are of known and acceptable quality. This goal is achieved by a program that sets standards for personnel qualifications; facilities, equipment, and services; data generation and recordkeeping; data quality assessments; and audits and corrective actions. . . .

The text for Section 7.1 MONITORING was taken from EPA. 1990. Draft *Site Designation, Monitoring, and Management Guidance Document for Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Tetra Tech, Inc.

6.2 MANAGEMENT

. . . The ocean dumping regulations (§ 228.3) define site management as

- Conducting disposal site evaluation and designation studies
- Regulating times, rates, and methods of disposal and quantities and types of material to be disposed of
- Developing and maintaining effective ambient monitoring programs for the site
- Recommending modifications in site use and/or designation

For dredged material disposal, site designation and permitting considerations often are considered simultaneously. Designation of sites by the EPA must take into account the type of material that will be disposed and the [*potential*] requirements of the permits that will be issued by the [*USACE*].

The EPA has delegated the designation of dredged material disposal sites to its Regional offices. . . . Upon interim- or continuing-use designation, the sites will continue to be managed by those Regional offices. Because permits [*controlling the actual*] use of the sites are issued by the [*USACE*], District offices [*necessarily play a role*] in the management scheme. Management responsibilities and areas of coordination are described in Region-specific Memoranda of Understanding (MOU). A national MOU covers general areas of coordination.

6.2.1 Conducting Disposal Site Evaluation and Designation Studies

All site-management decisions attempt to minimize any acute and chronic (short- and long-term) adverse effects on the site, the marine environment surrounding the site, and public health. Careful evaluation and designation of a site is the first management decision made toward ensuring that ocean dumping will not promote adverse effects. Appropriate site selection can also maximize the success of specific management options, such as disposal in depressions or pits and capping. For this reason, the characteristics of the material to be disposed at the site and the types of management options that will be necessary generally are considered during the site-designation process. A site is designated before a permit is issued.

. . . The [*USACE*] may contribute to the [*EPA*] site-designation process by conducting surveys or participating in the development of the Environment Impact Statement (EIS). When the EPA has not [*designated*] a disposal site or when the use of a designated site is not feasible, the [*USACE*] may select a site as part of the permit process. In either case, the [*USACE*] selection must meet the criteria of the ocean dumping regulations, subject to EPA concurrence.

Site-designation is based on environmental evaluation of the site. A site is evaluated according to the criteria in the ocean dumping regulations. . . . The EPA and the [*USACE*] must work closely together on both the site-designation and permitting process.

6.2.2 Regulating Times, Rates, and Methods of Disposal and Quantities and Types of Materials To Be Disposed

Limitations to the length of time and for dumping periods allowed (including seasons), and limitations on the quantities and rates of dumping may be stated as part of the . . . site-designation. Conditions stated [*in*] the permit [*would reflect*] the limits imposed by the site-designation. Including these limits as part of the site designation allows the EPA to manage the effects resulting from multiple dumpers using the site. For example, the EPA can set limits on the total amount of material (mass load) that may be disposed within a site.

Although scheduled times, rates and methods of disposal, and quantities and types of materials to be disposed at a site can be specified when the site is designated, these issues usually are [*more specifically*] addressed in the permits to use the site. Permits for disposal of dredged material are issued by the [*USACE, subject to an EPA review role*]. . . . The [*USACE*] Districts are responsible for getting the EPA involved in the permitting proces at the earliest stages in order to avoid problems when the EPA [*reviews*] the permit. This includes sampling and analysis plans for the dredged material and permit-specific requirements. . . .

An important step in the permitting process is to test the material to be disposed to determine its acceptability for ocean disposal under the regulations and its suitability for a specific site. This process involves ensuring that all the requirements of the regulations, including the physical, chemical, and toxicological issues are satisfied. The process of testing for and assessing toxicity of the material and bioaccumulation through the food chains [*are*] described in Part. 227 of the ocean dumping regulations and is detailed in a Battelle report . . . . The process entails evaluating the potential impacts in the water column and the sediments. Dredged materials must be tested at the initiation of any project to establish permit conditions and [*generally should be reevaluated*] every 3 years for a long-term project to ensure that the material has not changed. This testing should be done following the procedures outlined in the dredged material testing manual . . . and only Tier I testing may be necessary. Subsequent testing may also be required as a permit condition . . . , or, for example, if environmental . . . conditions at or near the disposal or dredging site have changed.

All physical and chemical characteristics of material are not included in the testing procedures presented in the [*dredged material testing manual*]. However, they are considered in determining the suitability of the material for ocean disposal and in developing permit conditions. Ideally, to . . . minimize adverse effects from dumping, the physical characteristics of the [*dredged material*] would (1) have similar grain-size distribution to the site; (2) minimize dispersion – unless the site is purposely chosen for its as dispersive character; (3) not increase turbidity in the vicinity of the site. Dredged material with a grain size distribution that is similar to ambient conditions at the site can ease recolonization of benthic organisms that have been covered by the dredged material and help to ensure that a unique habitat is not destroyed. The regulations specify that certain chemical contaminants be present in less than trace amounts.

In practice, it may not be possible to find an acceptable site with physical characteristics that match those of the dredged material. In that case, the site manager must consider the potential for environmental effects that result from the physical characteristics of the waste.

Regulating times for disposal may include seasonal limits to avoid ocean dumping when, for example, fisheries species are spawning in the area or when recreational use is at peak. Such regulation may also prohibit dumping during stormy weather or during periods when bottom currents are most likely to disperse material from the site. Time restrictions may be absolute or they may be linked to measurements that must be made in the field.

Disposal rates may be regulated to ensure that all material is released quickly so that the material falls through the water column in one mass. Alternatively, a maximum rate may be specified. Maximum rates of disposal are most frequently regulated when water-column effects are possible and limiting permissible concentrations may be reached.

Disposal methods may include specification that only bottom dumps are allowed or that material must be discharged through a submerged pipe. Both of these options minimize water-column impacts. Additionally, target areas within the dumpsite may be specified to limit the benthic impacts of dumping. Specific requirements for navigation generally are specified to ensure accurate and precise disposal.

Limits to total amount of material dumped at a site (mass load) help to ensure that a site is not used beyond its capacity. For example, appropriate water depths at the site must be maintained to ensure safe navigation and to ensure that material does not leave the site.

If a material does not meet the ocean dumping requirements detailed in the regulations, then the [*USACE*] may request a waiver from the EPA. Material disposed under a waiver [*may require*] monitoring and management specifications that reduce, the potential for environmental damages from dumping.

6.2.3 Developing and Maintaining Effective Monitoring Programs

. . . A strategy for monitoring should be included in the EIS prepared in support of site designation. This strategy should describe the environmental effects that may result from dumping and the general procedures that will be used to determine if those effects are occurring. The strategy may present a series of questions or formal null hypotheses concerning the fate and effects of the material to be dumped. Prior to use of the site, more detailed monitoring plan should be developed. . . . Monitoring should be specified as a permit condition, particularly for monitoring activities to be carried out by the permitees. Generally, such activities include continued reevaluation of the suitability of material for ocean dumping. They also may include field studies conducted during and following disposal to ensure that material does not leave the site, or that contaminants are not released from the dredged material, and that cumulative and chronic impacts to the site are determined.

Site managers use the results of monitoring activities to determine that conditions specified in permits are being met and that no unacceptable impacts are resulting from dumping activities. Monitoring activities results also are used to determine the specific activities to be included in continued monitoring. For example, a decision to reduce the program may be made when monitoring confirms that the criteria specified in the regulations are being met, that no long-term effects have resulted from disposal of material at the site. In such a case, the site monitoring might be reduced. However,

periodic testing of the material to be disposed would continue, and site monitoring should never be completely curtailed at an active site. If tests indicate that the characteristics of the dredged material have changed, site monitoring should be revised as appropriate.

Results generated by the monitoring program can guide the implementation of other specific monitoring activities. For example, a finding that material leached from the disposal site could prompt greater attention to water-column impact than had been planned initially. . . . A good monitoring program will accommodate the information obtained throughout the program, especially to use it to plan continued activities.

6.2.4 Recommending Changes in Site Use or Designation

Periodically, the EPA reviews information gathered during use of the site and determines if the site use and/or designation should be continued, amended, or revoked. These decisions can be based on the results of monitoring or on other circumstances that were initially considered during the permitting and site-designation procedures.

Modifications in site use or designation can include changes to permits, amendment to the site designation, or dedesignation of the disposal site. . . .

Dredged material permits can be revised or revoked by the [*USACE*] when it is determined that

- Dumping under the permit would result in violations of the ocean dumping regulations
- The site designation has been amended or revoked
- The dredging or disposal methods have changed
- The permit application was incorrect or incomplete
- Monitoring determined that significant adverse impacts could result or have resulted from dumping.
- Adverse impacts have resulted from dumping.

Changes in disposal-site designation or use may be instituted when

- The site is no longer needed or if it cannot be effectively managed
- When the EPA determines that activities at the disposal site have caused significant impacts.

. . . The Administrator may amend the site designation to add or change restrictions on site use. These changes [*would*] then be reflected in revised permits. Decisions that result from site monitoring and the management options that result from those decisions are determined individually for every site. . . . Site managers must evaluate site-specific information before deciding on any specific action.

The text for Section 7.2, MANAGEMENT was taken from EPA 1990; Draft *Site Designation, Monitoring, and Management Guidance Document for Ocean Disposal of Dredged Material.* In preparation by Battelle Ocean Sciences and Tetra Tech, Inc.

EPA REGULATORY FEEDBACK

7.0 EPA REGULATORY FEEDBACK

EPA has responsibility under Federal statutes and regulations to ensure that dredging and dredged-material disposal do not adversely effect the environment. As indicated in the preceding Sections, this includes sponsoring dredging research activities (Section 2.0), designating dredged-material disposal sites (Section 3.0), review of decisions to issue dredged-material disposal permits (Section 4.0), testing dredged material (Section 5.0), and monitoring and management of disposal sites (Section 6.0). During the course of dredging program experience, Regional regulators of the EPA, the USACE, State agencies, and other authorities recognize needs for Federal regulatory changes. These needs may result from research that finds that a particular contaminant is more or less toxic than previously had been believed and that the regulatory criteria should be changed accordingly. Similarly, as new, more accurate methods are developed to evaluate dredged material, select disposal sites, and assess environmental impact for dredged-material disposal, the regulations might need to be revised.

Presently, EPA is proposing revisions to update the 1977 *Ocean Dumping Regulations and Criteria,* 40 CFR 220-228. The proposed regulations would revise the ocean-dumping regulations applicable to dredged material and amend other parts of the regulations to codify statutory changes that have been made since the regulations were last revised. Revisions to the regulations comprise primarily three types of change:

- Incorporation of changes to improve clarity and to reflect dredging-program experience
- Reorganization of the regulations so that permitting of ocean dumping of dredged material is covered in an essentially standalone section.
- Incorporation of changes required to codify statutory changes.

To comply with Federal statutes and regulations to protect the environment, EPA dredging policy is interactive with ongoing dredging research and operation experience. The policy serves as guidance for complying with existing Federal regulations. When environmental problems with the regulations are identified, EPA works to affect a positive revision.

REFERENCES

8.0 REFERENCES

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